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FIRST PART

THE INTERNATIONAL TRADE IN FEEDING STUFFS.

Annual Review, No. 3. *April 1, 1917.*

INTRODUCTION.

This third *Annual Review* gives the *International Trade in Feeding ffs* up to the end of 1916 as far as the present conditions allow, and ording to the scheme established in the second Review (1).

Two new headings have been introduced: soya and soya-cake, brewing dues; for these are given, under the heading *coefficients*, the factors used calculate the production of concentrates on the basis of the available ply of raw materials.

Although international events have decreased the trade, as is shown by figures given, it is fairly clear that the importation of soya into countries g concentrates should regain its hold and thus it will be useful to de- in future the extension of this trade. Brewing-residues have become more important as concentrated foods (including yeast and dried lees) or without preparation, and it is certain that some countries do not t completely utilise these by-products.

As regards colza, only the production in India is given, as only the cur- figures are of importance.

1) Annual Review, No. 2, April 1, 1916.

In a new table of the prices of various concentrates are given the rate of various products (rice bran, locust beans, brewers' grains) which at the present time are of more than usual interest.

In the table of prices of various cakes, the rate of sesame and palmnut cake are given together with those of soya, rape and sunflower cake as quoted on the principal markets.

Appended are a few general remarks on each of the various chapters.

Production. — The new regulations requiring a higher yield of bread flour from wheat has caused a decreased production of bran in various countries. Similarly in the trade in oil seeds and fruits, a general decrease is observed, resulting in the production of less cake, especially in the importing countries. As regards palmnuts, trade has so been disturbed that the production of palmnut cake has become concentrated in the United Kingdom. A lower yield in sugar-beet by-products is also observable in the countries for which figures are given, because the production of raw material has decreased; from this the United States is excepted as there the growth of sugar-beets has much increased.

Foreign Trade. — Similar effects are seen as in production.

The trade in concentrated foods has almost ceased, due to difficulty of transport and also part to the insufficient production of forage in the exporting countries, especially in South America.

Price. — The lack of supplies on the markets has resulted in a large increase in prices, which is also due to other causes.

Bibliography. — The number of publications that have been examined at the International Institute of Agriculture and which are quoted in the bibliography, amounts to 680 titles, mostly referring to work done in finding new feeding stuffs for supplementing the lack of ordinary forage.

PRODUCTION OF CONCENTRATED FOODS FOR LIVESTOCK

Coefficients.

According to the method stated in the previous Review, the production of concentrates has been calculated on the basis of the quantities of raw materials available for consumption by the aid of the following coefficients which correspond to conditions actually obtaining in the industry.

WHEAT BRAN = $[(a + c) - (b + d)] \times \frac{25}{100}$.

RYE BRAN = $[(a + c) - (b + d)] \times \frac{32}{100}$.

= Production. b = Quantity sown c = Imports. d = Exports

RICE RESIDUES.

Husks = $[(a + c + e) - (b + d)] \times \frac{20}{100}$.

Bran = $[(a + c + e) - (b + d)] \times \frac{10}{100}$.

= Production. b = Quantity sown. c = Imports of rice in husk. d = Exports of rice in husk. e = Exports of rice not in husk.

Non-producing countries:

Husks = $(a - b) \times \frac{20}{100}$.

Bran = $(a - b) \times \frac{10}{100}$.

= Imports of rice in husk. b = Exports of rice in husk.

LINSEED CAKES = $[(a + c) - (b + d)] \times \frac{50}{100}$.

= Production. b = Quantity sown. c = Imports. d = Exports.

COTTON CAKES. — Except in the case of the United States, for which the official factor is 38 % of the yield in seed, the coefficient employed for calculating the output of cake from the availability figures in the different countries is 50 %. This variations is explained by the different conditions of extraction.

RAPE CAKES = $[(a + c) - (b + d)] \times \frac{50}{100}$.

= Production. b = Quantity sown. c = Imports. d = Exports.

SOYA CAKES. — For countries importing soya, the production of cake has been estimated at the rate of 80 % of the net importation.

OTHER KINDS OF OIL CAKES. — The production has been calculated on a basis of 50 % of the quantity available of the raw material.

RESIDUES OF BEET SUGAR INDUSTRY.

Beet slices (calculated on quantity of dry matter) = Production $\times \frac{5}{100}$.

Molasses = Production $\times \frac{2}{100}$.

BREWING RESIDUES.

Malt-dust = Beer produced $\times \frac{1}{100}$; Dried Grains = *id.* $\times \frac{6}{100}$; Other residues = . $\times \frac{1}{100}$.

Milling Residues.

Production of Wheat Bran.

(calculated on basis of quantities of wheat available for consumption.

Countries	1912.	1913.	1914.	1915.	1916.
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	1 501 325	1 583 400	.....	.....	.....
Argentine	348 525	447 000	341 444	357 020	437 475
Austria-Hungary	1 544 875	1 358 125	.....	.....	.....
Belgium	469 725	479 625	.....	.....	.....
Bulgaria	181 500	215 525	144 770	.....	.....
Chili	119 276	128 328	83 195	144 850	.....
Denmark	68 950	76 425	53 979	68 197	.....
Egypt	184 500	237 575	208 406	236 322	228 621
Spain	625 600	676 000	777 567	918 672	.....
United States	4 094 000	4 019 600	4 241 175	4 872 539	2 723 090
France	2 206 825	2 318 225	2 140 914	1 749 048	1 494 048
Algeria	114 918	186 368	.....	177 291	139 550
Tunis	13 604	37 911	14 250	59 475	28 225
United Kingdon	1 752 400	1 701 975	1 720 048	1 600 697	1 658 550
Australia	219 551	275 550	230 623	94 770	769 698
Canada	577 775	582 525	506 703	1 693 585	42 615
British India	1 699 561	1 795 419	1 602 236	1 990 215	1 635 838
New Zeeland	47 810	32 226	34 275	45 960	44 253
Italy	1 426 625	1 764 775	1 264 646	1 257 252	910 077
Japan	182 550	206 700	162 449	165 875	.....
Norway	6 000	7 475	14 249	19 009	.....
Holland	132 950	139 650	130 174	186 231	213 918
Roumania	197 700	200 875	120 248	547 523	.....
Russia in Europe and Asia	3 842 925	5 259 500	3 773 342	5 431 161	.....
Sweden	89 800	107 475	.....	118 540	.....
Switzerland	138 300	154 225	131 271	146 145	120 725

As regards the estimation of wheat and rye bran in Germany see the notes in the Review No. 2.

As a result of the new regulations made in various countries in order to increase the yield of bread, which decreases the production of bran, an average coefficient of 20 % of yield in wheat bran has been retained for Italy for 1915, which coefficient has been reduced to 15 % for 1916. For France an average yield of wheat bran of 20 % has been calculated for 1916. In 1914 this yield will probably be reduced still further, even in other countries previously remaining at the adopted normal limit of 25 %: thus, in the United Kindgom, the new regulations of 1917 have raised the yield of flour to 80 (81) % which can be raised further to 85 (86) %, (*The Manufacture of Flour and Bread Order*, No. 62, 1917).

PRODUCTION OF RYE BRAN,

(calculated on basis of quantities of rye available for consumption).

Country	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	2 894 717	3 045 716	.....	.....	.....
Austria-Hungary	1 262 272	1 136 000	.....	.....	.....
Belgium	195 008	216 960	.....	.....	.....
Bulgaria	38 446	47 724	.....	.....	.....
Chili	1 056	1 088	.....	.....	.....
Denmark	179 712	197 012	120 074	119 886	.....
Spain	122 432	197 504	158 001	476 799	.....
United States	256 128	290 400	234 577	271 603	201 780
France	368 032	373 472	312 775	224 739	247 492
Australia	416	704	.....	.....	.....
Canada	18 779	16 992	13 395	13 415	12 799
Italy	39 771	43 260	38 171	29 776	37 880
Norway	61 820	68 189	54 280	60 552	.....
Netherlands	198 400	208 096	150 640	118 520	96 300
Roumania	4 672	60 896	1 821	16 947	.....
Russia in Europe and Asia	7 072 480	6 789 600	5 394 507	6 556 313	.....
Sweden	198 674	187 008	241 713	183 680	177 373
Switzerland	18 652	18 430	15 001	15 570	.....

PRODUCTION OF RICE RESIDUES.

(calculated on basis of quantities of rice available for consumption).

Countries	1912		1913		1914		1915		1916	
	Husk	Bran	Husk	Bran	Husk	Bran	Husk	Bran.	Husk	Bran
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
a) Producing countries.										
Spain	48 300	24 150	44 000	22 000	48 980	24 490	46 680	23 340	.....	.....
United States	100 980	50 490	103 200	51 630	96 320	48 160	120 120	60 060	172 100	86 050
British India	9 068 338	.....	9 083 492	.....	8 669 119	.....	6 388 166	.....	5 093 541	.....
Italy	95 674	47 837	113 340	56 670	118 380	59 190	110 363	55 182	110 011	55 005
Japan	1 752 094	.....	2 140 634	.....	1 995 807	.....	1 525 113	.....	.....	.....
Dutch East Indies	1 084 461	.....	1 025 346	.....	1 285 413	642 707	.....	.....	.....	.....
Siam *	100 155	50 078	188 717	94 359	.....	.....	.....	.....	.....	.....
b) Non-producing countries.										
Germany	20 074	10 037	32 678	16 339	.....	.....	.....	.....	.....	.....
Argentine	2 960	1 480	3 520	1 760	2 320	1 160	.....	.....	.....	.....
Austria-Hungary	16 200	8 100	17 018	8 509	.....	.....	.....	.....	.....	.....
Belgium	9 840	4 920	4 400	2 200	.....	.....	.....	.....	.....	.....
Denmark	0,2	0,1	1	0,6	0,6	0,3	.....	.....	.....	.....
France	11 656	5 828	9 456	4 728	7 880	3 940	12 100	6 050	.....	.....
Algeria	200	100	200	100	260	130	1 400	700	880	440
United Kingdom	19 360	9 680	17 720	8 860	.....	.....	.....	.....	.....	.....
Australia	5 280	2 640	5 060	2 530	.....	.....	.....	.....	.....	.....
Canada	3 580	1 790	4 420	2 210	4 620	2 310	5 280	2 640	6 400	3 200
Norway	20	10	.....	.....	.....	.....	.....	.....	.....	.....
Russia	8 220	4 110	6 280	3 140	.....	.....	.....	.....	.....	.....
Sweden	2 980	1 490	2 040	1 020	2 160	1 080	.....	.....	.....	.....
Switzerland	1 800	900	2 760	1 380	1 920	960	680	340	.....	.....

* according to the export of husked rice.

Residues of Oil Industry.

Linseed.

PRODUCTION OF LINSEED CAKES.

(calculated on quantities of seed available).

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
a) Producing countries.					
Austria-Hungary	27 594	36 670	...	...	...
Belgium	41 725	56 765	...	...	...
Bulgaria	77	...	...	...	...
Chili	340	143	...	...	...
United States	369 267	237 164	257 537	322 702	313 965
France	73 609	119 852	63 154	17 342	...
Canada	166 633	...	42 747	85 869	10 791
British India	...	...	93 526	9 983	57 374
Italy	24 410	27 170	18 944	21 974	16 648
Netherlands	78 495	102 851	97 821	36 490	88 752
Roumania	5 518	...	473	...	...
Russia in Europe	94 262	145 566	...	...	...
Sweden	...	14 145	...	...	...
b) Importing countries.					
Germany	162 350	278 100	...	...	...
Denmark	5 800	9 900	...	...	...
United Kingdom	134 600	308 900	62 277	54 013	63 682
Australia	1 400	1 748	...	...	...
Norway	5 000	7 350	...	...	...

Cottonseed.

PRODUCTION OF COTTONSEED CAKES AND MEAL IN THE UNITED STATES (based on the crop yield).

Products	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Production of cottonseed	5 537 457	5 719 801	(6 803 887)		
Worked cottonseed:					
Alabama	314 996	388 681	455 746	297 656	
Arkansas	226 216	276 730	285 136	243 749	
Carolina North	306 281	226 543	417 992	297 250	
Carolina South	281 046	288 444	351 775	270 008	
Florida	17 299	21 455	30 078		
Georgia	572 285	781 247	956 107	717 508	
Louisiana	137 658	139 276	159 596	125 429	
Mississipi	357 100	455 703	478 907	341 134	
Missouri	20 338	25 396	29 235	22,262	
Oklahoma	308 946	373 118	372 611	208 128	
Tennessee	149 416	235 465	252 134	205 423	
Texas	1 425 157	1 058 112	1 373 936	1 018 501	
Other States	37 723	55 109	79 974	64 088	
	4 154 461	4 325 279	5 243 227 [1]	3 811 136	
Production of cakes and meal	1 813 463	1 896 017	2 296 533	(1 669 278)	

No figures available

(1) Including 30 102 metric tons estimated for working.

EXPORTS OF COTTONSEED BY PRODUCING COUNTRIES.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric t
Brasil	36 793	49 779	31 060	10 017	(1)
China	18 598	11 032	7 689	7 830	(1)
Egypt	472 302	373 703	346 060	367 499	215
United States	19 090	11 161	4 974	936 (2)	
French colonies:					
New Caledonia		39	737	1 331	(1)
British possessions:					
India	144 230	218 307	329 526	67 062 (3)	82
Nigeria	4 123	5 981	5 444	(1)	(1)
Uganda (year ending March 31)	2 974	5 704	9 000	(1)	(1)
	151 327	229 992	343 970	(67 062)	(82
Peru	14 583	26 422	18 228	(1)	(1)
	712 693	697 128	752 718	(454 675)	(301

(1) Figures not available. — (2) 10 months. — (3) 11 months.

Cottonseed trade of Importing Countries.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany:					
imports	214 097	219 797 (1)	120 973	(2)	(2)
exports	1 802	809 (1)	230	(2)	(2)
	212 295	218 988 (1)	120 743	(2)	(2)
Austria-Hungary:					
imports	11 233	3 813 (1)	2 096	(2)	(2)
exports	1 498	1 255	.....	(2)	(2)
	9 735	2 558 (1)	2 096	(2)	(2)
France:					
imports	34 935	17 670	14 742	2 303 (3)	1 624
exports	141	925	708	1 955 (3)	630
	34 794	16 745	14 034	348 (3)	994
United Kingdom:					
imports	640 228	625 205	649 835	502 522	334 520
Japan:					
imports	.....	12 039	14 373	31 187 (4)	10 131

(1) 1st. half-year. — (2) Figures not available. — (3) 11 months. — (4) 10 months.

Production of cottonseed cakes in importing countries,

(calculated on quantities of seed available).

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	106 147	109 494 (1)	60 371	(2)	(2)
Austria-Hungary	4 867	1 279 (1)	1 048	(2)	(2)
France	17 397	8 372	7 017	174 (3)	497
United Kingdom	320 116	312 602	324 917	251 261	167 101
Japan	.....	6 019	7 186	15 593 (4)	5 065

(1) First halfyear. — (2) Figures not available. — (3) 11 months. — (4) 10 months.

Colza.

To the table giving the production of rape cake in the second Review it is sufficient to add the figures for British India for the last three-year period 1914 — 1916, figures based upon the rape available in the country.

	1914	1915	1916
	metric tons	metric tons	metric tons
Production of rape-cake in British India	426 879	571 634	480 205

Exportation of Ground-Nuts by Producing Countries.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Former German Colonies:					
E. Africa	6 079	(1)	(1)	(1)	(1)
China:					
in hulls	*51 793*	*63 741*	*35 773*	*20 082*	(1)
equivalent in hulled seeds	38 845	47 806	26 830	15 061	(1)
hulled seeds		5 263	35 204	13 063	(1)
	38 845	53 069	62 034	28 124	(1)
Egypt *	794	557	296	163	983
French Colonies:					
Senegal:					
in hulls	*184 762*	*229 941*	*280 527*	*303 067*	(1)
equivalent in hulled seeds	130 571	172 456	210 395	227 300	(1)
Upper Senegal and Niger:					
in hulls	*1 761*	*8 577*	*2 435*	(1)	(1)
equivalent in hulled seeds	1 321	6 433	1 821	(1)	(1)
hulled seeds	5 830	(1)	(1)	(1)	(1)
French Guinea:					
in hulls	*2 020*	*3 541*	*3 325*	*1 266*	(1)
equivalent in hulled seeds	1 515	2 656	2 494	949	(1)
Mayotte and dependencies:					
in hulls	*34*	(1)	(1)	(1)	(1)
equivalent in hulled seeds	25	(1)	(1)	(1)	(1)
Indo-China:					
hulled seeds	405	643	(1)	(1)	(1)
French possessions in India:					
in hulls	*5 281*	*3 511*	(1)	(1)	(1)
equivalent in hulled seeds	3 961	2 633	(1)	(1)	(1)
hulled seeds	85 726	103 727	(1)	(1)	(1)
	229 354	(288 548)	(214 710)	(228 249)	(1)
British colonies:					
India	221 679	259 158	266 050	131 676	(2) 158 601
Gambia	65 199	68 486	67 958	97 680	(1)
Nigeria:					
in hulls	*1 743*			(1)	(1)
equivalent in hulled seeds	1 307	19 000	15 000	(1)	(1)
hulled seeds	2 559			(1)	(1)
Uganda	464	598	390	8	(1)
	291 208	347 242	349 398	(229 364)	(158 601)
Japan	3 919	5 928	5 556	5 580	(3) 6 547
Dutch colonies:					
East-Indies:					
in hulls	*3 266*	*13 793*	*9 974*		(1)
equivalent in hulled seeds	2 449	10 345	7 480	11 235 **	(1)
hulled seeds	9 940	6 268	7 655		(1)
	12 389	16 613	15 135	(11 235)	(1)
Portuguese Colonies:					
Portuguese S. E. Africa	8 672	5 759	(4) 792	(1)	(1)
	501 352	(692 632)	(647 921)	(502 715)	(166 131)

* Exported for direct consumption. — ** Java only. — (1) Figures not available. — (2) 11 months — (3) 10 months. — (4) Part figures.

Ground-Nut Trade of Importing Countries.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
many:					
ports	69 869	98 085	(1) 83 940	(2)	(2)
mark:					
ports	1 188	3 666	(1) 2 418	(2)	(2)
ted States:					
nports:					
in hulls	*5 324*	*5 844*	*9 042*	*5 266* (3)	*3 802*
equivalent in hulled seeds	3 993	4 383	6 781	3 949 (3)	2 851
hulled seeds	776	5 019	11 845	4 905 (3)	7 707
	4 769	9 402	18 626	8 854 (3)	10 558
rance:					
mports:					
in hulls	*222 380*	*255 713*	*270 194*	*255 713* (4)	*135 367*
equivalent in hulled seeds	166 785	191 785	202 645	191 785 (4)	101 525
hulled seeds	245 236	237 754	269 814	237 754 (4)	217 585
	412 021	429 539	472 459	429 539 (4)	319 110
xports:					
in hulls	*13 644*	*16 999*	*12 634*	*8 015* (4)	*2 858*
equivalent in hulled seeds	10 233	12 749	9 475	6 011	2 143
hulled seeds	5 665	2 192	1 909	3 615 (4)	1 331
	15 898	14 941	11 384	9 626 (4)	3 474
	396 123	414 598	461 075	419 913 (4)	315 636
herlands:					
nports	52 179	67 428	64 167	47 416 (4)	18 865
xports	12 794	19 616	21 700	6 548 (4)	46
	39 385	47 812	42 467	40 868 (4)	18 819

(1) 1st half-year. — (2) Figures not available. — (3) 10 months. — (4) 11 months.

Production of Ground-Nut Cakes in Importing Countries
(calculated on quantities available for consumption).

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
rmany	34 934	49 042	(1) 41 970	(2)	(2)
nmark	594	1 833	(1) 1 209	(2)	(2)
ited States	2 384	2 701	9 313	4 427 (3)	5 279
nce	198 061	207 899	230 537	209 956 (4)	157 818
herland	19 692	23 906	21 233	20 434 (4)	9 409

(1) 1st half-year. — (2) Figures not available. — (3) 10 month. — (4) 11 month.

Sesame.

EXPORTATION OF SESAME BY PRODUCING COUNTRIES.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric t
Former German Colonies:					
E. Africa	1 881	(1)	(1)	(1)	(1)
China	120 892	123 001	75 638	138 934	(1)
Ottoman Empire *	12 192	(1)	(1)	(1)	(1)
French Colonies:					
Upper Senegal and Niger	7	50	(1)	(1)	(1)
French Guinea	411	762	889	507	(1)
Indo-China	894	1 246	(1)	(1)	(1)
	1 312	(2 058)	(889)	(507)	(1)
British Possessions:					
India	62 360	104 069	100 940	11 293 (2)	61
Sudan	6 094	6 839	(1)	(1)	(1)
British E. Africa (year ending Mar. 31)	3 494	4 088	3 871	(1)	(1)
Uganda (year ending Mar. 31)	709	1 596	910	(1)	(1)
Nigeria	448	1 055	(1)	(1)	(1)
Sierra Leone	46	36	(1)	(1)	(1)
	73 151	117 683	(105 721)	(11 293)	(61
Dutch Colonies:					
Dutch E. Indies	1 302	1 987	2 445	(1)	(1)
Portuguese Colonies:					
Portuguese E. Africa	1 330	7 963	(1)	(1)	(1)
	212 060	(252 692)	(184 693)	(150 734)	(61

* The figure for 1912 refers to the exports from the ports of Haifa, Jaffa, Mersina, Adalia, Ayas Smyrna. — (1) Figures not available. — (2) 11 months.

Sesame trade in Importing Countries.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany:					
imports	99 282	116 039	(2) 88 237	(1)	(1)
Austria-Hungary:					
imports	31 414	26 629	(2) 17 189	(1)	(1)
exports	4	455	(2) 1	(1)	(1)
	31 410	26 174	(2) 17 188	(1)	(1)
Denmark:					
imports	2 544	4 018	(2) 4 396	(1)	(1)
France:					
imports	19 611	20 586	21 675	15 874	(3) 58 490
exports	1 414	925	708	1 955	375
	18 197	19 661	20 967	13 919	(3) 58 115
Italy*:					
imports	25 358	24 774	28 863	41 271	(4) 43 101
exports	27	16	26	46	(4) 57
	25 331	24.758	28 837	41 225	(4) 43 044
Japan:					
imports	5 970	5955	6 744	11 921	(1) 8 330
Netherlands:					
imports	(1)	(1)	(1)	(1)	(3) 25 703
Russia:					
imports	3 999	(1)	(1)	(1)	(1)

* Sesame and ground-nuts. — (1) Figures not available. — (2) 1st half-year. — (3) 11 months. — (4) 10 months.

Production of sesame cake in importing countries.

(calculated on quantities available for consumption).

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	49 641	58 019	(2) 44 118	(1)	(1)
Austria-Hungary	15 705	13 087	(2) 8 594	(1)	(1)
Denmark	1 272	2 009	(2) 2 198	(1)	(1)
France	9 098	9 830	10 483	6 959	(3) 29 057
Italy*	12 665	12 379	14 418	20 612	(4) 21 522
Japan	2 985	2 977	3 372	5 960	(4) 4 165
Netherlands	(1)	(1)	(1)	(1)	(3) 12 851
Russia	1 999	(1)	(1)	(1)	(1)

* Sesame and Ground-nuts. — (1) Figures not available. — (2) 1st half-year. — (3) 11 months. — (4) 10 months.

Soya.

TRADE IN SOYA.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
a) Producing countries.					
China:					
exports	661 004	624 236	674 795	709 702	(1
Korea:					
exports	98 674	95 537	68 825	123 141 (2)	58 097
Japan:					
production	6 334 365	5 389 274	6 612 523	(1)	(1)
imports	129 725	106 831	150 965	118 824 (3)	60 198
exports			441	475 (3)	641
b) Importing countries.					
Germany:					
imports	96 268	106 066 (4)	64 235	(1)	(1)
Belgium:					
imports	444	4 753	(1)	(1)	(1)
Denmark:					
imports	33 981	48 069	(1)	(1)	(1)
United States					
imports			875	1 741 (3)	54 01
France:					
imports	17	45	(1)	(1)	(1)
Netherlands:					
imports	45 053	27 554	19 619	16 551 (5)	4 08
exports	16 545	14 422	14 037	128 (5)	
	28 508	13 132	5 582	16 423	4 08
United Kingdom:					
imports	191 789	77 679	72 303	173 653	66 41
re-exports	1 651	816	9 543	1 714	(1)
Russia:					
imports	360	393	164	49 (3)	
Sweden:					
imports	2	—	—	49	(1)

(1) Figures not available. — (2) 7 months. — (3) 10 months. — (4) 1st half-year. — (5) 11 month

TRADE IN SOYA CAKE.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
a) *Producing countries.*					
ina:					
exports	493 477	714 460	651 045	700 882	(1)
orea:					
exports	1 063	1 514		0 (2)	
pan:					
production			92 333	(1)	(1)
imports	518 056	726 920	627 636	741 515	(3) 674 403
b) *Importing countries.*					
ermany:					
imports	7 080	3 260	1 201	(1)	(1)
enmark:					
imports	14 767	19 262	4 964	(1)	(1)
exports	6 555	5 868	(1)	(1)	(1)
	8 212	13 394	(4 964)	(1)	(1)
nited States:					
imports	1 096	3 177	1 435	2 710	(1)
ance:					
imports	1 952	400	230	(1)	(1)
etherlands:					
imports	23 852	7 230	1 230	(1)	(1)
nited Kingdom:					
exports	475	304	90	189	39
ussia:					
imports	2 059	21 969	195	(1)	(1)
weden:					
imports	9 979	7 437	3 605	(1)	(1)

(1) Figures not available. — (2) 7 months. — (3) 10 months.

PRODUCTION OF SOYA CAKE IN IMPORTING COUNTRIES.

(calculated from the soya available).

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	77 014	84 853	51 388	(1)	(1)
Belgium	355	3 802	(1)	(1)	(1)
Denmark	27 185	38 455	(1)	(1)	(1)
United States	.....	.....	700	1 393 (2)	43 210
France	14	36	(1)	(1)	(1)
Netherlands	14 254	10 506	4 466	13 138 (3)	3 264
United Kingdom	143 431	62 143	57 842	138 922	53 130
Russia	288	314	131	39 (2)	4

(1) Figures not available — (2) 10 months. — (3) 11 months.

In giving, for the first time in tabular form, the figures for the international trade in soya and soya-cake, it will be useful to append some notes.

It is important to notice that the market for soya and its products, formerly limited to China and Japan, has of late years become international (Far East, Europe, North America).

The nature of the market has also changed: while soya passes between the countries of the Far East as raw material for providing human food and residues giving, after oil extraction, a good nitrogenous manure, it forms a return cargo for intercontinental trade, valuable chiefly for the oil it contains and the residue after extraction, which constitutes one of the most concentrated feeding stuffs on account of the high protein-content. The utilisation of soya in this way has started a new industry (England, Denmark, Germany, Netherlands), the development of which has been somewhat hindered by the present difficulty of transport.

One must bear in mind the essential difference existing in the use of soya cake (and others as well) between Europe and the Far East where these cakes are mostly used as a nitrogenous manure (rice, sugar cane), while here they are used as one of the most concentrated food stuffs for cattle.

Copra.

EXPORTATION OF COPRA BY PRODUCING COUNTRIES.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
er German Colonies:					
Africa	4 242	(1)	(1)	(1)	(1)
goland	163	(1)	(1)	(1)	(1)
w Guinea and dependencies.	17 391	(1)	(1)	(1)	(1)
noa	11 201	(1)	(1)	(1)	(1)
	32 997	(1)	(1)	(1)	(1)
ed States, Philippines	141 200	76 000	87 344	139 092	(1)
ch colonies:					
ory coast	22	2	(1)	(1)	(1)
homey and dependencies.	301	236	199	213	(1)
hoon	1	1	(1)	(1)	(1)
do-China	7 982	5 645	8 414	7 864	(1)
w Caledonia and depends.	2 856	3 216	3 104	4 323	(1)
nch possessions in Oceania	6 113	9 010	(1)	(1)	(1)
	17 275	18 110	(11 717)	(12 400)	(1)
ish possessions:					
dia (year ending March 31)	32 387	34 901	38 804	32 356 (2)	15 839
ylon	31 197	59 555	71 730	61 396	(1)
rated Malay States	7 831	9 436	14 732	6 316 (3)	3 110
ish Borneo	569	655	998	(1)	(1)
rawak	103	71	152	(1)	(1)
ychelles	2 735	2 984	3 671	2 887	(1)
auritius	8	99	(1)	(1)	(1)
anga	11 298	3 481	4 449	(1)	(1)
ji	13 930	8 056	(1)	15 482	(1)
w Guinea (year end. March 31)	1 009	807	1 220	(1)	(1)
lomon Isles (British)	4 095	3 645	5 898	5 431	(1)
ish E. Afr. (year end. March 31)	1 611	1 589	1 612	(1)	(1)
nzibar	9 482	9 603	10 138	8 722	(1)
old Coast	630	640	667	782	(1)
geria	96	98	(1)	(1)	(1)
inity and Tobago	1 433	524	1 070	1 808	(1)
nta Lucia	1	4	7	(1)	(1)
maica	21	32	83	509	(1)
itish Guiana	58	56	86	82 (4)	81
	118 494	136 236	(155 317)	(135 771)	(19 030)
ch colonies:					
va	84 650	80 268	68 343	58 382	(1)
acassar	37 822				(1)
ngir, Menado, Gorontalo	30 076	113 547	130 145	112 086	(1)
adang	17 351				(1)
	169 899	193 815	198 488	170 468	(1)
tuguese colonies:					
rtuguese E. Africa	4 732	4 035	(1)	(1)	(1)
Domingo	(1)	(1)	(1)	120	(1)
	(1)	(1)	(1)	33	(1)
	(484 597)	(428 196)	(452 866)	(450 020)	(19 030)

(1) Figures not available. — (2) 11 months. — (3) 3 months. — (4) 8 months.

Copra Trade of Importing Countries.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric t
Germany:					
imports	183 258	196 449 (2)	82 956	(1)	(1)
exports	981	549 (2)	573	(1)	(1)
	182 277	195 900 (2)	82 383	(1)	(1)
Austria-Hungary:					
imports	45 537	33 305 (2)	14 882	(1)	(1)
Belgium:					
imports	25 774	19 552 (2)	11 118	(1)	(1)
exports	7 170	6 957 (2)	4 707	(1)	(1)
	18 604	12 595 (2)	6 411	(1)	(1)
Denmark:					
imports	24 595	31 144 (2)	13 690	(1)	(1)
United States:					
imports	30 940	17 826	31 066	51 354 (4)	57
France:					
imports	153 506	112 040	96 363	131 371 (5)	97
exports	92	312	68	369 (5)	
	153 414	112 328	96 295	131 002 (5)	97
United Kingdom:					
imports	(3)	14 432	42 837	120 021	(1)
Italy:					
imports	58	90	3 108	14 641 (4)	6
exports	0	0	0	702 (4)	
	58	90	3 108	13 939 (4)	6
Japan:					
imports	2 908	2 558	3 038	4 121 (4)	12
Netherlands:					
imports	102 230	100 635	109 420	210 288 (5)	78
export	78 350	82 356	77 108	106 845 (5)	
	23 880	18 279	32 312	103 443 (5)	78
Russia:					
imports	63 906	(1)	(1)	(1)	(1)

(1) Figures not available. — (2) 1st half-year. — (3) Not specified. — (4) 10 months. — (5) 11 mon

PRODUCTION OF COPRA CAKE IN IMPORTING COUNTRIES

(calculated on amounts available).

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	91 138	97 950 (2)	41 191	(1)	(1)
Austria-Hungary	22 768	16 652 (2)	7 441	(1)	(1)
Belgium	9 302	6 297 (2)	3 205	(1)	(1)
Denmark	12 272	15 572 (2)	6 845	(1)	(1)
United States	15 470	8 913	15 533	25 677 (3)	28 950
France	76 707	56 164	48 147	65 509 (4)	48 215
United Kingdom	.....	7 216	21 418	60 010	.....
Italy	29	45	1 554	6 969 (3)	3 195
Japan	1 454	1 279	1 519	2 060 (3)	6 072
Netherlands	11 940	9 139	16 156	51 721 (4)	39 257
Russia	31 953	(1)	(1)	(1)	(1)

(1) Figures not available. — (2) 1st half-year. — (3) 10 months. — (4) 11 months.

Oil-palm.

EXPORTATION OF PALM KERNELS BY PRODUCING COUNTRIES.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric ton
Former German colonies:					
Cameroons	15 999	(1)	(1)	(1)	(1)
Togoland	11 639	(1)	(1)	(1)	(1)
	27 638	(1)	(1)	(1)	(1)
Belgian Congo	5 895	7 207	(1)	(1)	(1)
French Colonies:					
Senegal	1 764	1 901	1 501	1 724	(1)
Upper Senegal and Niger *	847	475	2 275	(1)	(1)
French Guinea	5 135	5 172	4 726	5 829	(1)
Ivory Coast	6 799	6 949	5 652	6 113	(1)
Dahomey and dep.	37 296	26 371	21 578	23 370	(1)
Central Congo	.....	.....	162	559	(1)
Gaboon	359	575	809	609	(1)
Indo-China	42	.....	(1)	(1)	(1)
	52 242	41 443	(30 703)	(38 204)	(1)
British possessions:					
Nigeria	187 587	177 524	165 058	156 370	164 165
Sierra Leone	51 574	49 991	36 491	44 028	(1)
Gold Coast	14 864	9 899	5 723	4 129	(1)
Gambia	452	554	503	331	(1)
	254 477	237 968	207 775	204 858	(164 165)
Portuguese colonies:					
Portuguese Guinea	6 065	6 626	(1)	(1)	(1)
St. Thomas and Prince	1 013	1 241	1 264	(1)	(1)
	7 078	7 867	(1 264)	(1)	(1)
	347 330	(294 485)	(245 742)	(243 062)	(164 165)

(*) Kernels of *Butyrospermum*. — (1) Figures not available.

TRADE IN PALM KERNELS OF IMPORTING COUNTRIES.

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany :					
imports	261 408	235 917	(2) 113 205	(1)	(1)
Austria-Hungary :					
imports	39 906	27 043	(2) 1 127	(1)	(1)
Belgium :					
imports	6 402	4 265	(2) 2 262	(1)	(1)
exports	- 565	790	(2) 698	(1)	(1)
	5 837	3 475	1 564	(1)	(1)
Denmark :					
imports	1 773	595	(2) 406	(1)	(1)
France :					
imports	2 077	2 986	3 135	18 463	(4) 16 234
exports	40	12	7	4	(4) 271
	2 037	2 974	3 128	18 459	(4) 15 963
United Kingdom :					
imports	(3)	(3)	75 997	236 992	* 379 004
re-exportation	(3)	(3)	9 332	24 565	(3)
Italy :					
imports **	254	110	343	519	(3) 478
Netherlands :					
imports	56 863	63 711	56 187	25 829	(4) 28 842
exports	48 439	57 563	35 534	83	(4) 0
	8 424	6 148	20 653	25 746	(4) 28.842

* Including copra and other oily fruits. — ** Of *Bassia*, *Stillingia* and palm. — (1) Figures not available. — (2) First half-year. — (3) Not specified. — (4) 11 months. — (5) 10 months.

PRODUCTION OF PALM KERNEL CAKES IN IMPORTING COUNTRIES

(calculated on quantities available).

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	130 704	117 958	(2) 56 602	(1)	(1)
Austria-Hungary	19 953	13 521	(2) 563	(1)	(1)
Belgium	2 918	1 737	(2) 782	(1)	(1)
Denmark	886	297	(2) 203	(1)	(1)
France	1 018	1 487	1 562	9 229	(3) 7 981
United Kingdom	.....	.....	37 998	118 496	* 189 502
Italy	127	55	171	259	(4) 238
Netherlands	4 212	3 074	10 326	12 873	(3) 14 421

* Including copra. — (1) Figures not available. — (2) First half-year. — (3) 11 months. — (4) 10 months.

Residues of Sugar Industry.

PRODUCTION OF BEET RESIDUES

(calculated on the production of sugar-beet).

Countries	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
		a) *Dried slices.*			
many	832 110	847 000	845 939	505 900	.....
stria	396 190	348 100	338 742	.....	.....
ngary	241 985	243 250	200 715	124 425	.....
lgium	86 515	69 595	.....	.....	.....
lgaria	3 065	4 250	15 000	.....	.....
nmark	49 300	46 500	48 364	41 300	.....
in	39 590	59 100	32 146	36 178	27 274
ited States	236 975	256 690	239 882	330 774	338 902
nce	361 105	301 505	187 553	57 403	95 498
stralia	205	320	378	525	.....
nada	9 115	6 715	4 926	6 396	3 221
ly	87 150	136 500	67 500	74 330	65 000
therlands	108 805	83 265	99 709	83 307	95 940
mania	14 610	14 120	11 248	.....	.....
ropean Russia	536 200	617 585	.....	.....	.....
bia	7 500	.....	.....	.....	.....
eden	42 325	42 260	43 863	38 832	.....
itzerland	.....	1 580	1 350	1 250	1 000
		b) *Molasses.*			
rmany	332 844	338 800	338 376	202 300	.....
stria	158 476	139 240	135 497	.....	.....
ngary	96 794	97 300	80 286	49 770	.....
lgium	34 606	27 838	.....	.....	.....
lgaria	1 226	1 700	6 000	.....	.....
nmark	19 720	18 600	19 346	16 520	.....
in	15 836	23 640	12 858	14 471	10 910
ited States	94 790	102 676	95 953	132 310	135 561
nce	144 442	120 602	75 021	22 961	28 199
stralia	82	128	151	210	.....
nada	3 646	2 686	1 970	2 558	1 288
ly	34 860	54 600	27 000	29 732	26 000
therlands	43 522	33 306	39 884	33 323	38 376
mania	5 844	5 648	4 499	.....	.....
ropean Russia	214 480	247 034	.....	.....	.....
bia	3 000	.....	.....	.....	.....
eden	16 930	16 904	17 545	15 533	.....
itzerland	.....	632	540	500	400

Residues from Brewing.

By using the latest available figures for the production of beer in the chief producing countries as a basis, a start can be made to fix the yield in residues of utility as food for stock. These residues may be classed under three principal headings:

a) *Malt dust*, at an average calculated rate of 88 % of dry matter,

b) *Dried grains* at an average calculated rate of 91 % of dry matter,

c) *Various residues*, yeast, lees, used hops; it may be allowed that $^1/_{10}$ of these are made up of yeasts and dried lees with 89 % of dry matter, and of used hops with 25 % of dry matter.

WORLD PRODUCTION OF BREWING RESIDUES

(calculated from the production of beer).

Countries	Malt-dust	Dried Grains	Various Residues
	metric tons	metric tons	metric tons
Germany (1912-13)	67 817	406 903	67 817
Argentine (1911)	1 002	6 015	1 002
Austria-Hungary (1912)	24 717	148 303	24 717
Belgium (1912)	16 000	96 000	16 000
Bulgaria (1912)	230	1 380	230
Chili (1910)	600	3 600	600
Denmark (1912)	2 448	14 689	2 448
Spain (1911)	390	2 340	390
United States (1912-13)	76 533	459 198	76 533
France (1912)	15 822	94 932	15 822
United Kingdom (1911-13)	59 058	354 347	59 058
Greece (1911)	92	555	92
Italy (1911-12)	710	4 260	710
Japan (1911)	253	1 521	253
Norway (1912)	530	3 180	530
Netherlands (1912)	1 920	11 520	1 920
Rumania (1911-12)	310	1 861	310
Russia and Finland (1911)	11 444	68 661	11 444
Serbia (1911)	148	889	148
Sweden (1911-12)	2 739	16 434	2 739
Switzerland (1912)	3 100	18 600	3 100
Other countries	7 000	42 000	7 000
TOTALS . . .	292 863	1 757 188	292 863

FOREIGN TRADE OF VARIOUS COUNTRIES

Direct Agricultural Produce.

FOREIGN TRADE IN CEREAL GRAINS, PULSE AND ROOTS USED IN FEEDING LIVE-STOCK.

Countries	Imports				
	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons
ermany:					
Barley	2 756 925	3 087 067	1 600 495	(2)	(2)
Beans	25 565	15 290 (1)	7 040	(2)	(2)
Lupins	13 280	6 689 (1)	8 557	(2)	(2)
Vetches	25 181	15 263 (1)	12 000	(2)	(2)
ustria-Hungary:					
Vetches	6 167	565 (1)	2 762	(2)	(2)
elgium:					
Seeds and their non-food derivatives other than bran	1 691	1 344 (1)	544	(2)	(2)
razil:					
Manioc flour	...	...	...	...	...
anada:					
Locust-beans *	1 903	13 377	16 470	1 005	(2)
rance:					
Locust-beans	24 150	18 087	10 933	13 176	18 780
Raw dried manioc	23 850	20 051	19 084	10 594	13 548
rench colonies:					
Algeria:					
Locust-beans	...	...	...	...	...
Indo-China:					
Dried manioc	...	...	...	...	...
nited Kingdom:					
Locust-beans	66 087	31 667	38 030	47 858	(2)
ritish Possessions:					
Cyprus:					
Locust-beans	...	...	...	...	...
taly:					
Locust-beans	7 114	5 089	4 470	4 786 (3)	110
etherlands:					
Wheat	17 905	21 616	(2)	(2)	(2)
Rye	5 575	6 554	(2)	(2)	(2)
Barley	8 368	11 137	(2)	(2)	(2)
Buckwheat	259	206	(2)	(2)	(2)
Beans and vetches	389	(2)	(2)	(2)	(2)
utch colonies:					
East Indies:					
Dried roots	...	...	...	...	...
and residues of manioc	...	...	...	...	...

* Imports also seeds not specified and locust beans. — (1) First half-year. — (2) Figures not available — (3) 11 months.

FOREIGN TRADE IN CEREAL GRAINS, PULSE AND ROOTS USED IN FEEDIN LIVE-STOCK (*continued*).

Countries	Exports				
	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric to
Germany:					
Barley	1 157	6 018	(1) 2 216	(2)	(2)
Beans	170	872	(1) 365	(2)	(2)
Lupins	478	727	(1) 637	(2)	(2)
Vetches	1 295	924	(1) 471	(2)	(2)
Austria-Hungary:					
Vetches	3 748	2 306	(1) 696	(2)	(2)
Belgium:					
Seeds and their non-food derivatives other than bran	3 748	2 306	(1) 696	(2)	(2)
Brazil:					
Manioc flour	3 644	4 688	4 728	4 177	(2
Spain:					
Locust-beans*	565	44	85	1 158	(2)
France:					
Locust-beans	104	28	18	53	3
Raw manioc	.....	.....	.....	.....	.....
French colonies:					
Algeria:					
Locust-beans*	6 922	2 658	3 004	3 144	3
Indo-China:					
Dried manioc	1 468	1 493	3 030	—	(2)
United-Kingdom:					
Locust-beans	.....	.....	.....	.....	.....
British possessions:					
Cyprus:					
Locust-beans	64 680	45 711	47 613	(2)	(2)
Italy:					
Locust-beans	5 166	4 354	4 640	1 427 (3)	17
Netherlands:					
Wheat	14 001	17 308	(2)	(2)	(2)
Rye	2 892	3 805	(2)	(2)	(2)
Barley	6 520	8 507	(2)	(2)	(2)
Buckwheat	59	6 768	(2)	(2)	(2)
Beans and vetches	252	(2)	(2)	(2)	(2)
Dutch colonies:					
East Indies:					
Dried roots and	12 903	14 158	6 541	(2)	(2)
residues of manioc	17 313	25 940	17 947	(2)	(2)

* Imports also seeds not specified and locust-beans. — (1) First half-year — (2) Figures not availa — (3) 11 months.

Residues of Milling Industry.
FOREIGN TRADE IN BRAN (wheat, etc.).

Countries	Imports					Exports				
	1912	1913	1914	1915	1916	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	1 606 250	1 414 256	(1) 610 703	(2)	(2)	16 708	23 284	(1) 13 139	(2)	(2)
Argentine	.....	.....	.....	.....	.....	325 226	274 058	230 934	145 449	(5) 19 223
Austria-Hungary	147 882	140 924	(1) 66 334	(2)	(2)	37 183	30 591	(1) 23 680	(2)	(2)
Belgium	55 776	73 174	(1) 45 843	(2)	(2)	42 908	22 048	(1) 16 501	(2)	(2)
Brasil	.....	.....	.....	.....	.....	54 424	54 814	43 782	20 987	(2)
China	59 368	127 561	106 515	118 048	(2)	45 137	62 109	25 863	45 700	(2)
Denmark	55 277	45 222	29 401	(2)	(2)	.....	456	383	(2)	(2)
Spain	1 555	5 209	68	8	(2)	3 999	215	400	1 301	(2)
United-States	.....	.....	.....	.....	.....	85 290	4 670	5 281	18 740	(5) 5 272
France	171 688	231 931	201 852	16 145	30 278	36 888	35 549	11 478	9 854	5 644
Algeria	.....	.....	.....	.....	.....	14 651	19 935	14 116	9 128	16 962
Tunisia	.....	.....	.....	.....	.....	2 586	.....	.....	.....	.....
United-Kingdom	209 674	232 666	248 472	419 030	191 760	317 121	162 018	84 118	2 679	2 186
Australia	2 048	424	(2)	(2)	(2)	6 706	12 222	(2)	(2)	(2)
Canada (year end. Mar. 31)	.....	.....	.....	.....	.....	81 077	84 450	105 552	52 739	(2)
British India	2 764	3 850	2 582	2 673	(4) 4 057	244 291	244 250	193 326	196 351	(4) 7 639
Italy	9 187	10 618	4 287	4 007	(4) 569	28 155	31 823	37 275	5 378	(4) 2 649
Japan	28 184	39 558	14 989	18 450	(3) 7 367	.....	.....	.....	.....	.....
Norway	.....	.....	.....	.....	(2)	21 256	15 975	10 992	40	(2)
Netherlands	40 646	43 827	22 407	(2)	(2)	66 575	63 937	34 029	(2)	(2)
Dutch E. Indies	7 477	7 172	9 045	(2)	(2)	585	324	494	(2)	(2)
Russia	.....	.....	.....	.....	.....	835 207	794 000	448 300	78 249	(3) 62 442
Sweden wheat	58 485	55 780	46 386	(1) 20 420	(2)	2 029	1 250	2 236	(2)	(2)
Sweden others	2 945	2 401	1 581		(2)	23 005	24 165	8 317	(2)	(2)
Switzerland	14 908	10 151	5 143	1 141	(3) 3 924	14 304	17 057	11 123	4 175	(3) 1 013
Uruguay	.....	.....	.....	.....	.....	8 981	2 321	741	31	(2)

(1) 1st half-year. — (2) Figures not available. — (3) 10 months. — (4) 11 months. — (5) 9 months.

Foreign Trade in Rice Residues (bran, etc.)

Countries	Imports					Exports				
	1912	1913	1914	1915	1916	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	213 741	206 475	(1) 87 450	(2)	(2)	7 285	4 068	(1) 3 635	(2)	(2)
Argentine	.....	.....	.....	.....	.....	2 159	2 574	1 301	.....	.....
Austria-Hungary	13 876	5 816	(1) 2 092	(2)	(2)	15 747	11 079	(1) 2 544	(2)	(2)
Denmark	3 380	4 495	(2)	(2)	(2)	.....	.....	.....	.....	.....
United States	55 368	65 345	47 620	35 834	(3) 12 354	7 970	1 975	2 014	602	(3) 20
France	26 718	50 419	76 980	71 740	66 903	2 266	9 645	28 864	16 779	4 677
Indo-China	.....	.....	.....	.....	.....	107 097	238 280	307 989	265 975	(2)
Australia	22	13	(2)	(2)	(2)	3 233	2 160	(2)	(2)	(2)
Japan	13 284	16 121	8 676	1 735	(3) 1 200	.....	.....	.....	.....	.....
Norway	2 767	1 506	2 531	594	(4) 1 373	.....	.....	.....	.....	.....
Siam (year end. March 31)	.....	.....	.....	.....	.....	287 808	271 987	563 837	(2)	(2)
Sweden	5 069	4 907	1 299	(2)	(2)	268	315	319	(2)	(2)

FOREIGN TRADE IN VARIOUS MILLING RESIDUES (other than bran).

Countries	Imports					Exportation				
	1912	1913	1914	1915	1916	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Argentine:										
Maize residues	.....	.....	.....	.....	.....	1 742	1 656	1 299	.....	.....
Austria-Hungary:										
mill-feed	12	2	.....	.....	.....	780	1 148	(1) 1 065	(2)	(2)
United States:										
mill feed	.....	.....	.....	.....	.....	53 002	146 562	45 622	19 703	(3) 35.518
Italy:										
wheat (hard) (re-export)	.....	.....	.....	.....	.....	22 627	27 336	25 492	1 966	(4) 5 331
Netherlands:										
pollards	16 509	20 616	8 755	(2)	(2)	12 956	13 098	(2)	(2)	(2)
mill-feed (wheat, rye, buckwheat)	281 621	311 066	(2)	(2)	(2)	95 532	106 819	(2)	(2)	(2)
Switzerland:										
mill-feeds	53 543	57 937	35 987	283	(5) 137	83	69	106	1	(5) 30
milling offals	5 842	6 730	9 979	6 159	(5) 6 643	864	1 005	864	277	(5) 718

(1) 1st. half-year. — (2) Figures not available. — (3) 10 months. — (4) 11 months. — (5) 9 months.

Residues of Oil Industry.

Foreign Trade in Linseed Cakes and Meal.

Countries	Imports					Exports				
	1912	1913	1914	1915	1916	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Austria-Hungary	3 882	4 989	(1) 1 829	(2)	(2)	15 304	18 245	(1) 11 900	(2)	(2)
Denmark	11 334	66 338	67 232	(2)	(2)	272	471	286	(2)	(2)
Spain	.....	.....	.....	.....	.....	1 412	759	418	519	(2)
United States	.....	.....	.....	.....	.....	319 791	394 502	230 966	275 037	(3) 251 816
United Kingdom	55 135	83 679	47 555	66 647	75 610	4 977	5 551	3 796	96	61
Netherlands	261 099	275 122	220 849	216 624	(4) 148 383	.....	.....	.....	.....	.....
Sweden	2 192	4 359	1 621	(2)	(2)	313	224	.....	.....	.....

(1) 1st half-year. — (2) Figures not available. — (3) 10 months. — (4) 11 months.

Foreign Trade in Cottonseed Cakes and Meal.

Countries	Imports					Exports				
	1912	1913	1914	1915	1916	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Denmark	242 856	234 795	178 870	(2)	(2)	.....	.....	.....	.....	.....
United States	.....	.....	.....	.....	.....	543 470	455 893	285 355	661 539	(3) 440 973
United Kingdom	286 413	240 522	186 083	220 954	195 017	5 967	7 887	4 501	3 155	519
Netherlands	35 650	25 270	10 851	2 132	(4) 439	.....	.....	.....	.....	.....
Peru	.....	.....	.....	.....	.....	5 473	5 820	5 930	(2)	(2)
Sweden	17 804	9 485	13 080	(2)	(2)	172	1 704	1	(2)	(2)

Countries	Imports					Exports				
	1912	1913	1914	1915	1916	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	794 190	828 492	(1) 367 317	(2)	(-)	263 623	294 174	(1) 171 319	(2)	(2)
Argentine	...	...	...	...	...	17 622	20 952	17 403	18 479 (3)	8 435
Austria-Hungary	42 602	32 219	(1) 12 157	(2)	(2)	29 725	31 235	(1) 16 884	(2)	(2)
Belgium	242 354	255 952	(1) 116 514	(2)	(2)	71 423	56 810	(1) 29 731	(2)	(2)
China	161	19	14	...	...	544 543	793 836	81 033	72 708	...
Denmark	255 003	275 813	198 430	...	...	9 590	13 744	5 250	...	...
Egypt	...	...	...	...	...	80 778	62 977	79 987	111 670	83 247
United States	...	...	...	...	...	...	10 866	5 085	8 061 (4)	11 374
France	154 968	101 573	72 711	3 785	1 882	213 690	214 801	179 917	110 081	112 716
Algeria	3 909	2 684	2 112	1 768	1 236	...	...	...	...	...
United Kingdom	45 381	78 288	89 546	118 798	17 860	60 293	35 867	24 494	8 457	1 168
Australia	458	146	(2)	(2)	(2)	40	32	(2)	(2)	(2)
Ceylon	...	...	...	...	...	2 575	3 704	(2)	(2)	(2)
British India	18	52	500	462 (5)	199	150 656	181 676	151 342	152 285 (5)	122 571
Nigeria	...	...	...	...	...	...	4 910	1 254	(2)	(2)
South Africa	...	...	...	...	...	2 136	2 810	963	(2)	(2)
Italy	3 913	2 957	1 121	638 (5)	675	26 194	19 662	54 693	5 726 (5)	14 711
Japan	610 489	744 093	2 167 626	830 831 (4)	48 670	...	...	...	...	...
Norway	29 665	30 122	37 973	32 276 (6)	29 383	342	3 770	1 075	610 (6)	1
Netherlands	76 451	47 283	21 510	26 933 (5)	32 223	...	...	...	...	...
Dutch E. Indies	221	693	707	(2)	(2)	4 028	4 952	4 427	(2)	(2)
Russia	...	...	...	...	...	556 161	731 200	424 400	72 877 (4)	65 866
Sweden	154 853	145 416	108 895 (1)	82 171	(2)	...	143	28	...	...
Switzerland	34 091	29 928	17 608	17 339 (3)	21 063	956	1 015	419	21 (3)	1

(1) 1st half-year. — (2) Figures not available. — (3) 9 months. — (4) 10 months. — (5) 11 months. — (6) 8 months.

Residues of Sugar Industry.

FOREIGN TRADE.

Countries	Imports					Exports				
	1912	1913	1914	1915	1916	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany:										
beet slices	51 500	25 819	(1) 5 878	(2)	(2)	4 382	7 672	(1) 1 704	(2)	(2)
Austria-Hungary:										
beet-slices	13 367	11 277	(1) 6 615	(2)	(2)	17 462	18 086	(1) 413	(2)	(2)
Denmark:										
molasses	13	9	(2)	(2)	(2)	84	197	(2)	(2)	(2)
molasses feed	2 552	938	(2)	(2)	(2)	4 622	4 261	(2)	(2)	(2)
France:										
beet-pulp	42 938	1	6	13	2	962	488	648	154	22
British Guiana:										
«molascuit»	.....	.....	.....	.....	.....	5 198	6 970	2 466	2 269	(3) 1 321
Mauritius:										
«molascuit»	.....	.....	.....	.....	.....	376	434	(2)	(2)	(2)
Norway:										
molasses	5 958	6 704	7 987	6 996	(3) 4 310	.....	.....	.....	.....	.....
Dutch E. Indies:										
«molascuit»	.....	.....	.....	.....	.....	3 536	18 208	12 355	(2)	(2)
Sweden:										
molasses feed	6 712	4 980	8 345	(2)	(2)	1 130	.....	541	(2)	(2)

BREWERS' OFFALS (Coombs, etc.).

Countries	Imports					Exports				
	1912	1913	1914	1915	1916	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	146 528	157 256	(1) 69 999	(2)	(2)	.....	.....	.....	.....	(2)
Argentine	.....	.....	.....	.....	.....	894	297	1 462	.....	.....
Austria-Hungary	2 538	2 194	(1) 1 285	(2)	(2)	1 253	1 210	(1) 408	(2)	(2)
Denmark	742	678	(2)	(2)	(2)	166	84	(2)	(2)	(2)
United States	.....	.....	.....	.....	.....	72 987	81 925	29 697	2 256	(3) 1 591
United Kingdom	4 091	4 345	(2)	(2)	(2)	5 232	5 794	(2)	(2)	(2)
Australia	2	2	(2)	(2)	(2)	2 337	1 542	(2)	(2)	(2)
Switzerland	5 513	6 153	3 878	1 292	(4) 954	3 954	4 194	4 221	2 961	(4) 167

(1) 1st half-year. — (2) Figures not available. — (3) 10 months.

DISTILLERY AND STARCH RESIDUES, ETC. (Dried grains, etc.).

Countries	Imports					Exports				
	1912	1913	1914	1915	1916	1912	1913	1914	1915	1916
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons
Germany	6 747	68 900	(1) 29 267	(2)	(2)	3 044	5 178	(1) 4 031	(2)	(2)
Austria-Hungary	3 421	4 307	(1) 2 000	(2)	(2)	325	239	(1) 176	(2)	(2)
Denmark	306	21	(2)	(2)	(2)	.....	.....	.....	.....	.....
United States (maize germ cakes and meal)	.....	.....	.....	.....	.....	32 530	33 556	22 253	14 124	(3) 7 564
France	42 743	65 887	31 213	5 862	1 069	41 460	26 463	19 733	8 923	8 426
Sweden (maize milling offals)	10 658	13 767	11 475	(1) 18 758*	(2)	3 954	4 194	4 221	(1) 45*	(2)

(1) 1st half-year. — (2) Figures not available. — (3) 10 months. — * Including other products.

Residues of Animal Origin.

Trade in Fish and Meat Meal.

Countries	Imports					Exports				
	1912	1913	1914	1915	1916	1912	1913	1914	1915	19
	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	metric tons	me to
Argentine:										
meat meal	.....	.....	.....	.....	.....	3 374	2 744	1 701	354	
Denmark:										
meat meal	56	304	(1)	(1)	(1)	.....	.....	.....	.....	
Norway:										
fish meal	.....	.....	.....	.....	.....	14 548	8 929	8 978	10 448	
Paraguay:										
meat meal	.....	.....	.....	.....	.....	(1)	34	43	(1)	
Uruguay:										
meat meal	.....	.....	.....	.....	.....	1 900	1 500	1 000	46	

(1) Figures not available. — (2) 9 months. — (3) 8 months.

WHOLESALE PRICES OF CERTAIN FEEDING STUFFS.

Owing to the present condition of the international money market th divergence between the value in francs at par and that actually quoted i the various markets is very marked. Consequently, in order to have compar able data, we have converted the price in francs at par to terms of gold franc Considering the pound sterling as practically equivalent to gold, use ha been made of the exchange on London. A list of quotations is found belo the conversion coefficients can then be calculated by dividing the rate par by that obtaining on the particular date under consideration.

Attention is drawn to the increase in price of all the feeding stu quoted, which has become still more marked during the last mont of 1916, on all the markets not yet taxed.

(Value of the pound sterling relatively to various currencies).

Dates	Argentine (three months)		United States (cable)		France (cheque)		Italy (at sight)		Netherlands (cheque)		Scandinavia (Christiania at sight)	
	Gold Pesos	Coefficient	Dollars	Coefficient	Francs	Coefficient	Lire	Coefficient	Florins	Coefficient	Kroner	Coefficient
Value of the pound sterling at par.	*5.04*		*4.86 2/3*		*25.225*		*25.225*		*12.107*		*18.159*	
End January 1916.....	4.90	1.02857	4.76 13/16	1.02007	28.00	0.90089	31.975	0.78890	11.10	1.09072	17.50	1.03766
" February "	4.87	1.03491	4.76 7/8	1.02054	27.99	0.90121	32.10	0.78583	11.17	1.08389	16.95	1.07133
" March "	4.85	1.03918	4.77	1.02027	28.48	0.88571	31.50	0.80079	11.165	1.08437	16.45	1.10389
" April "	4.88	1.03279	4.76 15/16	1.02041	28.285	0.89182	30.45	0.81841	11.355	1.06623	15.65	1.16032
" May "	4.89	1.03067	4.76 7/16	1.02148	28.215	0.89403	30.225	0.83457	11.50	1.05278	15.95	1.13850
" June "	4.90	1.02857	4.76 3/8	1.02161	28.1375	0.89649	30.35	0.83114	11.475	1.05508	16.30	1.11405
" July "	4.95	1.01818	4.76 1/2	1.02134	28.13	0.89073	30.85	0.81767	11.51	1.05187	16.50	1.10055
" August "	4.87	1.03491	4.76 7/16	1.02148	28.115	0.89721	30.90	0.81634	11.545	1.04868	16.84	1.07833
" September "	4.87	1.03491	4.76 3/8	1.02161	28.775	0.87663	30.80	0.81899	11.67	1.03745	17.155	1.05853
" October "	4.86	1.03704	4.76 3/8	1.02161	27.79	0.90770	31.325	0.80527	11.025	1.04146	17.145	1.05914
" November "	4.71	1.07006	4.76 3/8	1.02161	27.79	0.90770	31.495	0.80092	11.665	1.03789	17.275	1.05117
" December "	4.71	1.07006	4.76 3/8	1.02161	27.80	0.90737	32.66	0.77235	11.68	1.03656	17.04	1.06567

Residues of Milling Industry.

SPOT PRICES FOR WHEAT BRAN (per 100 kilos).

Date	Buenos Aires home consumption	Genoa	London	Malmö	Minneapolis (in bags)	Paris
	Gold francs	Gold francs	Gold francs	Gold francs	Gold francs	Gold francs
End January 1916.....	3.40–3.74	15.78	22.09–22.33	26.66–27.38	11.37–11.66	16.67–16.89
" February "	3.19–3.42	15.72	22.33–22.58	27.53–28.27	11.08–12.24	16.22–16.67
" March "	3.20–3.43	.....	19.85–20.10	29.13–29.90	10.64–11.07	15.72–15.94
" April "	4.55–5.01	.....	19.73–19.98	31.43–32.23	10.64–11.08	16.72–16.94
" May "	4.76–5.10	.....	17.37–17.62	30.04–30.83	11.09–11.67	12.96–13.63
" June "	4.53–5.66	.....	13.65–14.27	29.40–30.17	9.92–10.50	14.57–14.79
" July "	5.04–6.28	.....	14.89–15.51	26.75–27.51	10.21–10.50	14.80
" August "	6.84–7.98	.....	17.37–17.99	26.21–26.96	12.25–12.84	16.15
" September "	7.87–9.58	.....	20.47–21.09	25.73–26.46	11.96–12.55	.....
" October "	12.55–13.69	.....	24.82–25.06	25.74–26.48	15.47–15.76	.....
" November "	15.31–16.49	.....	32.26–33.50	26.28–27.01	16.05–16.34	.....
" December "	11.79–12.26	.....	35.98–36.23	26.64–27.38	15.17–15.47	.....

SPOT PRICES FOR LINSEED CAKES (per 100 kilos).

Date	Copenhagen	Genoa	The Hague	London	Marseilles	New-York
	gold francs	gold francs	gold francs	gold francs	gold francs	gold francs
End January 1916	40.71–41.07	20.91–21.30	34.31–34.99	32.88–33.50	28.83	21.87–22.74
" February "	40.55–42.04	20.82–21.22	35.00–35.45	31.64–32.26	28.61	20.40–20.99
" March "	41.40–41.78	21.22–21,62	.....	29.78–30.40	28.12	17.49–18.65
" April "	43.92–44.32	21.95–22.37	.....	29.47–29.78	28.09–28.98	14.57
" May "	42.30–42.69	22.12–22.53	.....	31.95–32.26	28.16–29.06	15.17–15.76
" June "	41.39–41.78	22.03–22.44	.....	31.02–31.64	28.24–29.14	18.97
" July "	41.27–41.65	23.30–23.71	.....	31.95–32.26	29.37–29.59	18.96
" August "	40.44–41.19	23.27–23.67	.....	33.50–34.12	30.28	21.01
" September "	40.43–41.17	23.75–24.57	.....	35.36–35.98	30.68	22.47
" October "	43.03–43.40	25.77–25.97	.....	37.22–37.84	33.13	23.93–24.22
" November "	48.18–48.91	28.83–30.43	.....	40.95–42.19	35.49	25.10–25.68
" December "	48.10–48.84	29.35	.....	47.15–48.39	42.65	26.85

Spot Prices for Cottonseed Cakes (per 100 kilos).

Date	Copenhagen (Texas)	London (English)	New York (Mills, Texas = Galveston)
	gold francs	gold francs	gold francs
End January 1916	36.75–36.97	25.75–26.06	15.16
" February "	37.20–37.57	24.51–24.82	14.63
" March "	37.95–38.33	23.89–24.20	.....
" April "	42.30–42.71	23.58–24.20	.....
" May "	41.51–41.90	25.75–26.06	.....
" June "	40.62–40.77	24.51–24.82	.....
" July "	40.51–40.89	24.51–24.82	.....
" August "	41.04–41.19	24.20–24.51	.....
" September "	41.31–41.68	25.75–26.06	21.01
" October "	45.24–45.97	28.54–29.16	23.34
" November "	47.45–48.03	34.74	24.51
" December "	47.36–48.10	40.02–40.33	23.93

Spot Prices for Groundnut Cakes (per 100 kilos).

Date	Genoa	London (Coromandel)	Marseilles (Kufisque)
	gold francs	gold francs	gold francs
End January 1916	16.57–16.96	29.16–29.78	17.57–19.8
" February "	16.50–16.90	27.92	18.47
" March "	16.82–17.22	26.68–27.30	15.66–17.2
" April "	17.40–17.81	27.30	15.16–21.4
" May "	17.53–17.94	27.30	15.20–21.4
" June "	17.45–17.87	27.30	16.59–21.0
" July "	18.40–18.81	28.54	16.59–21.52
" August "	18.37–18.78	.....	24.22–25.12
" September "	18.02–18.43	.....	23.67–24.98
" October "	19.73–20.13	.....	21.78–26.31
" November "	22.43	.....	25.42–27.23
" December "	21.63	.....	27.22–29.04

SPOT PRICES FOR VARIOUS CAKES (per 100 kilos).

Date	Sesame		Soya		Rape	Palm-nut	Sunflower
	Genoa	Marseilles	Copenhagen	The Hague	Copenhagen	Liverpool	Malmö
	gold francs	gold francs	gold francs	gold francs	gold francs	gold francs	gold francs
End January 1916	16.17–16.57	18.47–18.92	36.03	35.79	33.51–33.65	23.89–24.51	.....
" February "	16.11–16.50	18.02–18.47	36.90–37.20	35.56	41.29–34.22	22.64–22.95	.....
" March "	16.42–16.82	15.50–15.94	38.18–38.33	35.58	34.11–34.50	20.78–21.40	.....
" April "	16.98–17.40	15.16–16.05	41.90–42.30	36.09	36.66–37.07	17.99–18.61	.....
" May "	17.11–17.53	15.20	41.11–41.51	37.83	35.58–35.97	19.23–19.85	.....
" June "	17.04–17.45	15.91–16.14	40.77–41.00	.....	34.43–34.81	19.23–20.16	.....
" July "	17.99–18.40	16.59–17.04	40.35–40.74	.....	33.03–34.01	19.85–20.47	.....
" August "	17.96–18.37	20.64	40.21–40.44	.....	33.32–33.70	22.33–22.64	.....
" September "	18.02–18.43	21.48–21.92	40.43–40.80	.....	33.08–33.45	22.64–23.58	.....
" October "	19.33–19.73	21.78–22.69	43.03–43.76	.....	43.03–43.40	27.30–27.98	.....
" November "	20.82	21.78–22.69	46.35–46.72	.....	39.05–39.42	32.57–33.19	.....
" December "	20.85	24.05	47.36–47.73	.....	.....	37.53–38.15	26.11

SPOT PRICES FOR COPRA CAKES (per 100 kilos).

Date	Genoa	The Hague	London	Marseilles (½ Cochin)
	gold francs	gold francs	gold francs	gold francs
End January 1916	17.36–17.75	26.81	26.37–26.68	.....
" February "	17.29–17.68	27.55	26.06–26.68	24.78
" March "	17.62–18.02	26.88–27.11	24.82–25.44	24.80
" April "	18.23–18.64	28.88	24.82–25.44	25.86
" May "	18.36–18.78	29.17	25.44–26.06	24.14
" June "	18.29–18.70	36.27	24.82–25.44	24.21
" July "	17.99–18.40	39.44	25.44–26.06	24.88
" August "	17.96–18.37	38.23	26.06–27.30	30.06
" September "	18.43–18.84	.....	.....	30.24–30.68
" October "	20.94–21.34	41.22–42.31	.....	31.77
" November "	.....	.....	35.98–37.22	32.68
" December "	23.17	.....	40.47–40.33	.....

Various Feeding Stuffs.

SPOT PRICES OF VARIOUS RESIDUES, ETC. (per 100 kilos).

Date	Rye Bran — Marseilles	Locust-beans — Marseilles	Dried brewers grains — London	Maize feed — New-York
	gold francs	gold francs	gold francs	gold francs
End January 1916	37.84	.....	21.71	16.62
" February "	41.46	22.53–27.04	21.71	16.62
" March "	44.29	21.70–23.03	21.71	16.61
" April "	44.59	23.19–24.08	21.09	16.61
" May "	44.70	26.82	21.09	16.63
" June "	44.82	27.79	20.47	16.63
" July "	44.84	27.80	19.85	16.63
" August "	43.96	26.92	21.09	16.63
" September "	36.82–42.95	20.16	21.09	16.63
" October "	38.12–45.38	19.52–19.97	24.20	16.63
" November "	38.12–45.38	19.97–21.78	31.02	22.76–23.34
" December "	54.44	20.87	34.74	21.59–23.93

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SECOND PART.

ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

3 - **The First School of Mechanical Cultivation founded in Germany.** — ECKMANN, E., in the *Illustrierte Landwirtschaftliche Presse*, Year 37, No. 10, pp. 54-58. Berlin, Feb. 3, 1917.

A short time ago an institute for teaching motor cultivation to agriculturists was founded at the Agricultural College of Roitz (Nieder Lausitz, Germany). This Institute, which was founded with the help of the Department of Agriculture and with grants from the local chamber of Agriculture, is the first of its kind in Germany.

The instruction given is partly theoretical and partly practical. The theoretical division includes instruction in the physical and chemical phenomena which take place in the motor. With the help of a series of pictures the pupils are shown the different types of ploughs whose peculiarities are explained. Agriculture and surveying are also included in the curriculum. During the hours of practical instruction every opportunity is seized to give theoretical explanations, so that the pupils may learn to know exactly the action and purpose of each different part of the machine. The Directors of the School hold that it is in no wise sufficient to give purely mechanical instruction in the use of a motor plough, but that the pupil must have a practical general knowledge with regard to the working of the soil and of the machine, so that he may understand the necessity and principles of the various parts.

The practical instruction bears, in the first place, on the working and guiding of the different types (rigid and non-rigid) in the fields and on the road, that is to say, without ploughing. Ploughing is then undertaken under most varied conditions. Thanks to the variety of the soil in its grounds, the school of Roitz offers the most favourable conditions in this respect. In practical work, special importance is attached

to developing the agricultural knowledge of the pupil, so that he may, in each case, learn to choose the most satisfactory combination of farming implements. He must also be able to ascertain rapidly and correctly the cause of accidents to the machinery, and, as far as possible, to repair them himself on the spot, and the driver of a plough must be able to take his motor to pieces and put it together again.

The pupils live in a building on the spot. They are under the superintendence of a "Pflugmeister" (ploughing master) who also directs the pratical work. The pupils do not pay for their board which amounts to 2 marks a day. There is also in the same building a canteen where they may buy food and drinks.

Attached to the Institute is an employment bureau for drivers and engineers of motor-ploughs which finds posts for the pupils free of charge and for other applicants on payment of a low fee. There is also an office which, on payment of a small sum, will give information with regard to motor-cultivation to all those interested in the subject.

CROPS AND CULTIVATION.

304 - **The Relation Between Forests and Atmospheric and Soil Moisture in India.** Hu M., in *Forest Bulletin*, No 33, pp. 1-11 + 2 Maps showing distribution of rainfall and forests. Calcutta, 1916.

For over half a century, special laws have been passed in India for the protection of hill catchment areas by making reserved forests and protected forests; these cover respectively 96 867 and 8 492 square miles. This Report gives the result of an enquiry organised by the Government of British India in order to determine the Relation between the forests on the one hand, and atmosphere and soil moisture on the other.

The examination of abundant material collected in all the Provinces shows that the protective measures which were introduced during the last decades, and carefully carried out, have decidedly prevented de-forestation in districts where the effects of the denudation of the country had begun to be most severely felt. These measures were moreover taken at the right time. During the first half of the 19th. century, the destruction of the forests proceeded apace, as agriculture developed and villages increased. While the contractors cut down jungles, the villagers did still more harm by uprooting stumps, grazing cattle on the young growth and firing the hillsides. The effect of such action was seen in the rivers, which became torrential during the flood season and shrank or dried up in the hot weather. This was the condition of affairs in the Province of Bombay, the Presidency of Madras (the district of the Parlakimedi Maliah hills and in the hill tracts of Vizagapatan) and especially in Chota Nagpur, Orissa and the Feudatory States.

The United Provinces, and particularly the large fine oak forests of the State of Tehri-Gahrwal, had suffered greatly from deforestation as had the diwaliks, the Salt Range, the Pabbi Hills and the Kangra District

In the neighbourhood of Simla, the forests of pines and of secular oaks had been cut down to provide ground for potato-growing, while the same destruction had occurred on the Myelat Plateau in the South Shan States, near the Chinese frontier.

In the enquiry made by the Government of British India information was chiefly required on the 3 following points:

1) The rainfall.

2) Differences in the level of the underground water-table.

3) The flow of rivers and streams.

1) *The rainfall.* — During the last 50 years, there have been no permanent changes in the rainfall which can be directly connected with the monsoons — winds caused and regulated by atmospheric changes in zones at a great distance from India, and therefore unaffected by local afforestation or the destruction of existing forests.

The data collected, however, lead us to infer that forest may increase rainfall to a certain limited extent (which does not reach 5 per cent) by promoting the condensation of aqueous vapour.

2) *The level of the under ground water-table.* — This has not altered during the last 50 years; it depends on the rainfall and varies directly with it.

3) *The flow of rivers and streams.* — This is the most important point of the enquiry. The chief data may be summarised as follows. In Eastern Bengal and Assam, even of late years, some small amount of forest denudation has taken place, but the rapid growth of vegetation on areas abandoned after cultivation has tended to neutralize the injury caused, which was not very extensive. In the United Provinces, the only definite case in which floods are believed to have been more violent and of shorter duration, is in the torrents of the Silwalik Hills, but this is certainly not due to the destruction of the forests which have not been destroyed, or encroached, upon, for 30 years.

The conclusion arrived at in Bengal, where in recent years destructive floods have been frequently caused by the rivers which discharged through the lowlands of Orissa, was that it is at least probable that denudation of the catchment area has been a contributory cause of these floods.

In the Central Provinces, it cannot be said that any wholesale denudation of forests has taken place, indeed, in some places the forests have improved rather than deteriorated. The same may be said of the Presidency of Madras. In accordance with these facts, the flow of the rivers and streams is equable. In the Punjab, the landslips, violent floods in the rivers, and the washing away of all cultivated soil in the Pabbi Range the Hoshiarpur Chaos, the Siwaliks, the lower Himalayas and the Salt Range are doubtless due to the denudation of forest growth.

It can therefore be said generally that in most Provinces no serious damage to the flow of rivers has taken place, and no great injury has been done to cultivation. There are, however, local exceptions, and much damage has been done in the Punjab, in Bengal and Assam. Where damage was acknowledged, it was on the whole admitted to be due to forest denu-

dation which changes the flow of the streams and accentuates their torrential character.

It may therefore be said that the measures of Forest Conservancy adopted by the Governement of India during the last 50 years have entirely satisfied the climatic and hydrographic requirements of the country, and have resulted in the preservation of a sufficient area of forests, so that no widespread damage arising from the destruction of forest growth has occurred. This is chiefly due to the formation of reserved and protected forests in the large catchment basins and if, as has been said above, inundations and floods have occurred in certain districts, these are due to the measures for forest protection not yet having been definitely enforced in these parts of the country. In fact, whilst the forests under the control of the Forest Department occupy 22.1 per cent. of the combined areas of all the Provinces of India, their distribution is very unequal; Bombay has approximately 10 per cent. of forests, Madras 13, Central Provinces 20 per cent., Bengal 13 per cent., Burma 59 per cent., Assam 46 per cent. whilst the Punjab has only 0 per cent., the United Provinces 4 per cent., and Béhar and Orissa 3 per cent.

305 - **The Influence of Meteorological Factors from Year to Year on the Glucometric Index of Musts from the Same Vine.** — See No. 366 of this *Bulletin*.

306 - **Availability of the Potash in Certain Orthoclase-Bearing Soils as Affected by Lime and Gypsum.** — BRIGGS, LYMAN J. and BREAZEALE, J. F., in *Journal of Agricultural Research*, Vol. VIII, No 1, pp. 21-28. Washington, D. C., January 2, 1917.

It is stated in agricultural treatises that the application of lime to a soil liberates potash from the soil minerals. This subject is of special import to the Citrus industry of southern California in which commercial fertilizers are extensively used and heavy applications of lime and gypsum are sometimes made.

Samples of pegmatite and orthoclase were collected near Riverside, Cal., representing, respectively, types of the potash-bearing rock and mineral from which many of the Citrus soils appear to be derived. These samples were finely ground and shaken for a number of days with aqueous solutions of calcium hydroxide and of calcium sulphate in graduated concentrations. The calcium hydrate solutions did not modify the solubility of the potassium in either pegmatite or orthoclase (see table I). Gypsum solutions depressed the solubility of the potassium in orthoclase, the quantity of potash in solution decreasing progressively as the concentration of the calcium sulphate increased (see table II). Similar tests were made upon a virgin soil of a granitic type from the experiment station near Riverside, Cal. The solubility of the potash was not measurably different in distilled water and in solutions of calcium hydrate or calcium sulphate (see tables I and II).

The addition of calcium sulphate to a Citrus soil from the Oatman tract, about 7 miles from Riverside, which had been under cultivation for some time and which was more granular and less weathered than the virgin soil, decreased the solubility of the potash (see table II).

TABLE I. — *Effect of solutions of calcium hydroxide on the solubility of the potassium in pegmatite, in orthoclase and in soil from the Citrus Experiment Station site.*

Solution No.	Pegmatite		Orthoclase		Riverside soil	
	Calcium oxide in 100 cc. of solution gm.	Potassium oxide in solution P. p. m.	Calcium oxide in 100 cc. of solution gm.	Potassium oxide in 100 c.c. of solution P. p. m.	Calcium oxide in 100 c.c. of solution gm.	Potassium oxide in 100 c.c. of solution P. p. m.
1	0.00	3.1	0.00	10.8	0.00	26.4
2	0.0123	3.1	0.0103	8.6	0.0103	26.4
3	0.0246	2.5	0.0207	12.0	0.0207	28.8
4	0.0369	3.1	0.0414	8.2	0.0414	28.8
5	0.0492	3.0	0.0621	9.1	0.0621	24.0
6	0.0738	3.0	0.0828	12.6	0.0828	27.6
7	0.0984	3.1	0.1035	12.1	0.1035	25.2
8 (a)	0.1230	2.8	(a) 0.1242	9.6	(a) 0.1242	27.6

(a) Solid phase present.

TABLE II. — *Effect of solutions of calcium sulphate on the solubility of the potassium in pegmatite, in orthoclase and in soil from the Citrus Experiment Station site.*

Solution No.	Pegmatite		Orthoclase		Riverside soil		Oatman soil	
	Calcium sulphate in 100 c.c. of solution gm.	Potassium oxide in solution P. p. m.	Calcium sulphate in 100 c.c. of solution gm.	Potassium oxide in solution P. p. m	Calcium sulphate in 100 c.c. of solution gm.	Potassium oxide in solution P. p. m.	Calcium sulphate in 100 cc. of solution gm.	Potassium oxide in solution P. p. m.
1	0.00	2.7	0.00	6.0	0.00	24	0.00	8.6
2	0.0221	2.1	0.018	4.5	0.017	24	0.017	8.6
3	0.0446	2.1	0.035	3.6	0.034	26	0.034	8.0
4	0.0668	2.0	0.070	3.6	0.068	29	0.068	4.2
5	0.0864	3.2	0.105	1.2	0.102	26	0.102	2.2
6	0.1330	2.2	0.140	0.8	0.136	26	0.136	2.2
7	0.1660	2.1	0.175	1.3	0.170	29	0.170	2.4
8 (a)	0.2100	2.8	(a) 0.210	0.5	(a) 0.210	26	(a) 0.210	4.2

(a) Solid phase present.

TABLE III. — *Potash absorbed by wheat seedlings from orthoclase and soi solutions as affected by calcium sulphate.*

Series No.	Treatment	Percentage of potassium oxide in dry plants
1	10 gm. of orthoclase, 2500 c.c. of carbon-treated water . .	1.10
1	Same, saturated with calcium sulphate	0.95
2	10 gm. of orthoclase, 2500 c.c. of carbon-treated water . .	1.84
2	Same, saturated with calcium sulphate	1.72
3	40 gm. of orthoclase, 2400 c.c. of carbon-treated water plus 200 p.p. m. NO_3 and 200 p.p. m. P_2O_5	2.56
3	Same, saturated with calcium sulphate	2.57
4	50 gm. of Oatman soil, 2500 c.c. of carbon treated water	1.75
4	Same, saturated with calcium sulphate.	1.35

The potassium content of wheat seedlings was practically the same when grown in water containing finely ground orthoclase and in a saturated calcium-sulphate solution containing the same quantity of orthoclase. Similar experiments in which a Citrus soil was used instead of orthoclase showed a decreased absorption of potassium by wheat seedlings in the presence of calcium sulphate (see table III)

In brief, the experiments indicate that the availability to plants of the potash in soils derived from orthoclase-bearing rocks is not increased by the addition of lime or gypsum. In some instances a marked depression of the solubility of the potash in the presence of gypsum was observed. These conclusions are based both on the results of the analyses of the solutions and on the measurement of the potash content of wheat seedlings grown in the solutions.

307 - **The Nature of the Sulphur of Swampy Soils Harmful to Plants and to Underground Constructions.** — THORNER, WILHELM, in *Zeitschrift für angewandte Chemie* Year 29, No. 47, pp. 233-236, Leipzig, 1916.

According to the researches and experiments of the author the active sulphur of swampy soils which is harmful to the growth of plants and to undergrouud constructions is not only found in the form of pyrites but in the free state, and perhaps also in an organic form. So long as it is below the level of the underground water it is quite harmless, but if these soils are turned or dug up, or if the level of the underground water drops, oxidation of the sulphur is caused by the action of the moisture and oxygen of the air. In the case of the pyrites this action is fairly strong and ferric sulphate and sulphuric acid are formed. The action on free sulphur is less strong, and sulphuric acid is formed directly. These oxidation products are not only very detrimental to the plants, but also to

he mortar of lime and cement of underground constructions (especially o concrete). With regard to sulphur finely distributed in sand or peat-bre, etc., prolonged evaporation of the water in contact with air leads o the gradual formation of sulphuric acid. This oxidation is probably aused by the following oxidising agents which are formed during the vaporation of the water — ozone, hydrogen peroxide and nitrous acid. imilar phenomena are produced when wet swampy soils containing ulphur are dug up or penetrated by the air. Under the influence of the ydrogen peroxide, ozone and oxygen at the time of their formation, he fine sulphur in suspension in the water is oxidised energetically to ulphuric acid.

08 - **The Irrigation Canal of the "Puszta Hortobágy", in Hungary** (1). — Kvassay, J., in *Közlekl*, Year 26, No. 52, pp. 1869-1870. Budapest, Dec. 23, 1916.

Amongst the most important hydraulical work carried out by the ngineers of the national Service of agricultural hydraulics, must be laced the construction of the irrigation canal of the " puszta Hortabágy" the greatest steppe of the " Alföld " [large plain] of Hungary). It has olved two very important questions which had been under consideration er more than 10 years : — the derivation of the waters of the Tisza across he great " puszta Hortobágy " and the improvement by irrigation of he alkaline soils there.

The canal starts from the right bank of the Tisza, above the parish of Tiszakeszi, and, after flowing 12 miles, it reaches the point where its rtility begins, ground of an area of 4 265 acres called in Hungarian " Csu-aya Föld " (bad ground) reserved by the town of Debreczen for experi-nental irrigation plains. The canal is so constructed that, during heavy loods (exceeding 13 feet), it receives the waters directly from the river, whereas, in normal times, the water is conveyed by pumps.

In the spring of 1916 the water flowed directly into the canal and wo basins of 711 acres were successfully immersed. During heavy loods the canal can give a volume of 881 gallons of water a second. It is spanned by large bridges of 13 feet whose platform is sufficiently igh to allow pontoons 10 feet wide to navigate the canal with ease. The pumps worked by two Lietzenmayer-Nicholson motors of 115 H.P. ach, can raise a volume of water of 528 to 660 gallons to a height of 10 o 13 feet a second.

Of 4 265 acres, the best parts, including 1 423 acres, are reserved for rrigation, whereas 2 843, divided into 8 plots, will be used as basins. As hese cannot be cultivated because of the strong alkalinity of the soil, hey will first be washed ; in the meantime they have been converted into ish tanks (2). In the spring of 1916, 2 basins of 711 acres were filled with ish, and so far the results obtained have been very satisfactory.

The work of building the canal, begun in 1913, is today finished to a

(1) See also : *B.* 1913, No. 141. (*Ed.*)

(2) On this subject see : *B.* 1916, No. 330. (*Ed.*)

large extent. The estimated cost of constructing the canal and the experimental fields was 1 million *Korona* (1), of which 650,000 have been expended up to the present ; the remainder is reserved for internal organisation. The State makes a grant of 500,000 *Korona* for the work of irrigation. It is hoped that 142 148 acres, made up partly by the great " puszta Hortobágy " and partly of the adjoining alkaline territory, will thus be improved and made fertile.

309 - **" Navazos " and their Use for Fixing Sandhills in the Province of Cadiz, Spain.** — DE CASTRO, MANUEL M. FERANDEZ, in the *Revista de Montes*, Year 41, No. 961, pp. 77-85, 3 figs. Madrid, Feb. 1, 1917.

The " navazos " form a characteristic method of improving sandy ground. The author describes those at the mouth of the Guadalete on the pliocene which, in the course of time has become covered with a sandy layer and transformed into sandhills. The land was redeemed for cultivation by converting it into " navazos ". It is possible to form a " navazo " wherever a shallow and pervious soil overlies a sub-soil which is only slightly pervious, so that, between the two, a layer of underground water is formed, which replaces irrigation by rising under capillary attraction. In the locality under consideration these strata are formed by the layer of sand and the pliocene respectively.

The " navazo " is formed in the following manner : — A rectangle of the surface to be cultivated is marked on the sand, which must have a maximum depth of 6 ½ to 10 feet. The sand is then removed to a depth of from 19 to 31 inches below the summer level of the undeground water. A convenient spot in this rectangle is dug to a further depth of from 3 to 5 feet, thus forming a permanent well, called by the natives " toyo ". When the undeground water does not rise to a sufficient height by means of capillary attraction, water is drawn from the " toyo " by means of buckets of a particular shape, and the plot irrigated thus. The gardener's house is built on the highest part of the sand on the boundary of the point excavated.

The land round the mouth of the Guadalete had been converted into a series of " navazos " placed next to each other. As sand continued to form, it at length became impossible to hold them any longer, and the abandoned " navazos " rapidly became sterile sandhills. It was then that the question of afforestation was considered.

The afforestation was carried out in 1905 to 1913 under the direction of the engineer ANGEL FERNANDES de CASTRO by means of stone-pines (*Pinus Pinea* L.)

In those parts of the " navazos " which have not yet been invaded by sand, that is to say, in the ground that has been well manured by former cultivation, the trees have grown with great force, so that some seven year old pines have reached a height of over 16 feet, and there are annual growths of nearly 5 feet. Growth is slower on the higher ground

(*Ed.*)

(1) 1 gold *krone* = 10*d*. *at par*.

which separates one "navazo" from another, but it is slowest in the ground where the sand has encroached.

The work of afforestation gave opportunities for various experiments. A group of closely planted trees was left to grow naturally, and it was found that the lower verticils of the *Pinus Pinea* died off completely, that is to say a sort of natural pruning took place. Where trees were planted at normal distances from each other this natural pruning did not take place, and it occurred still less where the trees were sparsely planted. In the latter cases it is, thererore, wise to prune. Round Cadiz and Seville pruning is carried out very energetically, and the small branches which are removed are used for heating baking ovens. The pines which grow in abundance, also supply wood for the construction of river boats and fishing smacks.

o - **Explorations and Studies of the Beds of Phosphorites in Russia : Report for 1914.** — Проф. Самойловъ, Я. В. (Samoilov, Ja. V. prof.), in *Отчетъ по геологическому изслѣдованію фосфоритовыхъ залежей* (*Reports on Explorations and Studies of Phosphorite Beds*), Vol. VII, pp. 1-25 + 1-591, 51 fig. + 8 plates + 17 maps. Moscow, 1915.

The Report for the year 1914 of the Commission for the Study of Phosphorite Beds (of the Agricultural Institute of Moscow), published by Prof. Samoilov, contains 12 detailed accounts of the phosphorite beds of many districts of Russia, made by various authors and enlarged with numerous figures, plates and maps. There is an introduction by Prof. Samoilov (pp. 1-25) which summarises the general results of the researches and explorations of 1914. The principal facts are given below.

In 1914 reseach work and explorations were carried out in the following provinces: Samara, Tambov, Koursk, Orel, Kalouga, and in the districts of Turgaish and the Ural Mountains. As in previous reports (1), this one gives the following details for each district studied:

1) The *productivity of the beds* expressed in *pouds* of 16.38 kg. per square *sajen* of 4.55 sq. m.

2) The *total surface area of the beds*, expressed in square *versts* of 1.138 sq. km.

3) The *total quantity of phosphorites* contained in the beds, expressed in millions of *pouds*.

4) The corresponding *total quantity of phosphoric anhydride*, expressed in millions of *pouds*.

The phosphorites are divided into 3 groups:

Group A:	Phosphorites containing from	12 to 18 %	of phosphoric anhydride	
Group B:	" " "	18 to 24 %	"	"
Group C	" " "	more than 24 %	"	"

Among the phosphorites studied in 1914 those of group *B* were found in the largest numbers. They were found in 13 out of 17 of the beds

(1) See *B.* 1915, No. 1258. (*Ed.*)

examined and usually contained 20 % of phosphoric anhydride. The phosphorites of the other 4 beds belonged to group *A*.

The districts examined in 1914 contained :

Total surface area of beds	1730 square miles.
Total quantity of phosphorites	1730 millions of tons
Total quantity of phosphoric anhydride	283 millions of tons
Average production	7 cwt. per 10 square miles.

If the quantity of phosphorites estimated in the beds in 1914 be added to that of preceding years, a total of 5020 millions of tons is obtained which may be divided amongst the 3 groups as follows :

	Quantity of Phosphorites	
	In millions of tons	Percentage
Group A (12 to 18 % P_2O_5)	3420	68.1
Group B (18 to 24 % P_2O_5)	1464	29.2
Group C (more than 24 % P_2O_5)	137	2
Total	5021	100.0

The Report ends with a study by Professor SAMOILOV of the phosphorite beds of the right bank of the river Desna (Krolevez district, Tchernigov province), which, on account of their origin, their form, the large accumulation of phosphoric nodules of various types, and the nature of the cementing body, present a particular scientific interest from a geological and mineralogical point of view.

311 - **The After Effect of Fertilisers applied to Maize, in Rhodesia.** — See No. 32 of this *Bulletin*.

312 - **Species Growing in the Botanical Garden of Casa Bianca, Grosseto Province, Italy.** — FENZI, E. O., in *Bollettino della R. Società Toscana di Orticultura*, Year XLII, No. 1, pp. 11-13. Florence, Jan. 15, 1917.

The Botanical Garden of Casa Bianca is situated at the southern end of Monte Argentario (Grosseto Province), and was founded in 1868 by general VINCENZO RICASOLI. In 1888 it already contained 1866 species of 626 different genera, and since then it has been continually enlarged. Amongst the most beautiful specimens growing the author mentions the following palm trees which bear fruit regularly : — *Cocos flexuosa* – *C. Romanzoffiana* — *Livistona australis* — *L. chinensis* — *L. olivaeformis* — *Sabal Blackburnianum* — *S. Palmetto* — *S. mexicanum* (= *umbraculiferum*) ; — and the following which do not bear fruit regularly : – *Phoenix reclinata* — *Ph. canariensis* — *Washingtonia gracilis*, etc. There are more than 100 species and varieties of experimental palms and about half of them bear seed each year. Amongst the Coniferae is a huge specimen of *Pinus Laricio* (= *P. Paroliniana*). *Araucaria Bidwillii* and *Agathis* (*Dammara*) *robusta* bear fruit there regularly. The following species are also notable : — *Aberia caffra* (excellent preserving fruit) — *Alpinia nutans*,

hich bears fruit — *Oreopanax floribundum* (= *Aralia Humboldtiana*) *Aralia nymphaefolia* — *Schefflera digitata* (= *Aralia Schefflera*) — *sculus californica* — *Chorisia speciosa* (produces the Brazilian kapok) — *is cotinifolia* — *Jacarandia ovalifolia* which bears fruit each year — *Kendya nigricans* — *Parkinsonia aculeata* — *Persea gratissima* (a very big ecimen which never bears fruit) — *Psidium Cattleianum* (abundant fruit) *Pittosporum undulatum* — *P. phylliraeoides* — *Schotia speciosa* — *ecio Barba-Joannis* — *Tecoma Ricasoliana* and other numerous species *Tecoma*. There are about 100 species of experimental eucalyptus; re than 150 species of acacias; about 100 species of *Agave*; about the ne number of *Opuntia*, almost all from Mexico; about 70 species of *Mebryanthemum*, etc.

- Development of the Root System of *Cirsium arvense* and *Medicago sativa* with Reference to Their Vegetative Reproduction; Observations carried out in Russia. — I. Пачоскій І. (Paczoskij, J.), The biological peculiarities of *Cirsium arvense* Scop., in *Трудьі Бюро по прикладной ботаникѣ* (*Bulletin of Applied Botany*), Year IX, No. 1 (86), pp. 1-16. Petrograd, Jan. 1916. — II. Берг О, (Berg, F.), Note on certain biological particularities of alfalfa and of *Cirsium arvense* Scop., *Ibid.*, No. 7 (92), pp. 353-357; July, 1916.

I. — The author has divided the vegetable organisms into the follow- g biological types on the basis of *a*) the importance of the changes season on plant life, *b*) the loss of various organs suffered by the plants unfavourable seasons:

1) *Evergreens* (all organs perennial).

2) *Trees and shrubs with deciduous leaves* (all organs perennial ept the leaves, which are deciduous).

3) *Undergrowth* (leaves, and top of stem annual).

4) *Herbaceous, perennial, hemicryptophyte plants* (all aerial parts ual).

5) *Herbaceous cryptophyte plants* (underground parts, to a certain th, and aerial parts, annual).

6) *Annual plants* (including " perennials " of which the buds which lace the seeds are the only parts to live though the winter).

From observations carried out under his direction at the Agricultural ition of Adjamsk (provincial zemstvo of Kherson) from the summer 1914 onwards, the author concludes that *Cirsium arvense* Scop. is a pical cryptophyte, for it has two kinds of root — a vertical one and a rizontal one. The *vertical root* may reach, or even exceed a depth of feet. The *horizontal roots*, which are rarely deeper than from 5 to 11 hes, run more or less parallel to the surface of the soil, and may reach, even exceed, a length of 7 feet. The buds from these roots give birth aerial shoots, which, later, become new plants. By means of these ots. *C. arvense* may spread along the surface even if fructification has en suppressed. This explains why, in a field which it has almost mpletely overrun, *C. arvense* forms clumps, whereas the first stages of estation are characterised by isolated plants.

The experiments carried out at the Adjamsk Station show that, at

the beginning of winter, not only the aerial part of the plant dies, but also the upper portion of the vertical root (or, in the case of a plant over a year old, the under-ground part of the stem). This total decay of the root reaches a depth of from 5 to 10 inches, and sometimes more, so that the new buds are placed a little below this depth, on the healthy part of the root.

According to the author *this biological peculiarity of C. arvense is very important and all other peculiarities of the plant are the result of the decay of its underground portions to a certain depth.*

The author admits that the depth of the new buds depends on the condition of the aerial parts of the plant in autumn. If the stalks of the plant are not cut before winter, the buds are placed deeper, and the upper part of the root also dies to a greater depth. On the other hand, if the stalks are cut level with the ground in autumn, the buds are nearer the surface, sometimes immediately beneath the cutting.

The author comes to the following conclusions, based on the previous observations and the fact that in the winter of 1914-1915 the *C. arvense* plants which shot up in July died of cold towards the spring, in spite of the mildness of the winter :

1) Plants springing from seeds of the current year up till autumn can have no influence on new clumps of *C. arvense* because they die before the spring. Therefore only those plants which shoot up in spring can form new clumps. It should be noted that plants of *C. arvense* grown from seed only develop rapidly during the second half of the summer, so that superficial digging of the ground immediately after the harvest will completely prevent the formation of new clumps of the plant.

2) Superficial digging over in autumn will fail to destroy *C. arvense* more and more in proportion as the digging is later and more shallow, for, in this way, only those parts of the plant which are already dead or dying will be cut, whereas the nutritive substances will already have passed into the deeper parts of the root, which remain alive. This fact has been amply confirmed by observations on *C. arvense* made in rye-fields belonging to peasants, where the soil is dug late and to a slight depth only.

3) It is probable that if *C. arvense* were cut to a given depth during spring, when the first shoots are about to pierce the earth, the plant would be still more injured especially if it were cut below the part on which the new buds are situated. The experiments carried out on this subject at the Adjamsk Station at different depths (to 17 inches) are not yet finished, but it has been observed that *C. arvense* is only slightly suppressed by cutting it to a slight depth (to 10 ½ inches), whereas cutting deeper produces a quite marked effect. There is no advantage in cutting deeper than 13 ½ inches, as the results obtained at this depth are as good as those obtained at 17 inches. It is obvious that cutting must remove that part of the plant on which the new buds are situated. Cutting once to a depth of 17 inches will not completely eradicate *C. arvense*, but it seems to

ure the harvest of spring cereals. Further experiments on this sub-
t will be carried out.

The actual methods of fighting *C. arvense* are reviewed. The author
of the opinion that it is only by making experiments on cutting at differ-
t depths and seasons that a really satisfactory method of fighting the
ed at a low cost can be found.

II. Attention is drawn to certain physiological peculiarities
Medicago sativa L. which resemble those of *C. arvense*; the alfalfa
very long vertical roots and, in the case of lesions, underground
s giving birth to aerial shoots are also formed. A description is
en of a case observed in the Jouriev district (Livonia), a district
her further north than that in which alfalfa is usually cultivated.
er an unfavourable winter all the undeground parts of this plant died
spring, and, when the ground thawed, the roots were found to be rot-
to a great depth. This plot was not broken up, and, after a few weeks,
roots produced new shoots from a depth at which they could hardly
expected, and the ground was covered with a vegetation which, though
thick at the time, grew considerably in the summer.

From the results of experiments on alfalfa carried out during many
ars the author thinks that this plant only survives the winter well when
roots have reached a great depth and the ground does not freeze.

The Chemical Composition of Tobacco during its Vegetative Period. Researches Carried out in Russia. — Кревсъ К. (Krevs, K.), in *Журналъ Опытной Агрономіи имени П.С. Коссовича* (*Review of Experimental Agriculture dedicated to the Memory of P.S. Kossovitch*) Vol. XVII, Pt. 4, pp. 278-288. Petrograd, 1916.

This paper is a preliminary note on the results of experiments which
ed at determining the succession in which substances contained in the
e tobacco plant accumulate, so as to improve the control in Russian to-
cco of the results obtained abroad, and to complete them by more de-
led information.

A considerable number of plants of the "Trapesonda" variety were
d, these had been cultivated in the grounds of the Iekaterinodar Labo-
ory for research in tobacco-growing. The tobaccos studied cannot be
sidered as typical either for the Kuban district, in which the laboratory
situated, or of other tobacco-growing districts, because they came from
ery rich tchernoziom field, of which a complete analysis will be published
the *Annals* of the Laboratory.

The tobacco was planted on the 15th. May, and samples were taken
ccessively on the following dates: — 4th., 15th., and 20th. June; 6th.,
th., and 31st. July; 20th. August. The following substances were deter-
ned separately in the leaves, stalks and roots of the samples:

le ash	Dextrine
e ash and its various components	Volatile organic acids
al nitrogen	Fixed organic acids (oxalic, citric and malic)
otine	
monia	Crude cellulose

Protein	Pentosans
Nitric nitrogen	Fats
Sugars	Sulphuric acid
Starch	Organic sulphur.

The results of determinations made from 200 samples are given in tables appended to the paper.

The tobaccos studied differ from those usually cultivated in their *external appearance*; they are taller and have thick, rough leaves, which give a strong and unpleasant smoke.

There are also variations in the *chemical composition* of the tobaccos studied and that of others, for example, they contain 3 to 4 % more protein than the others, with the exception of the *Nicotiana rustica* ("makhorta") variety. They also contain more fixed organic acids (malic and citric).

On the other hand they are distinguished by a large volume of nitric nitrogen, amounting to 5 % in some cases, whereas the tobaccos of other regions are poor in this element (traces — 0.3 %) with the exception of "makhorta" which contains as much as 1.1 %.

Finally, they are distinguished by a low carbohydrate content. Although all the plants were dried rapidly whilst still green, no more than 13% of carbohydrates was found in the transferred plants, and barely 9 % in ripe plants, whereas tobacco plants from the south of the Kuban district give as high a yield as 40 % of carbohydrates, with the exception of the "makhorta" variety in which the percentage of carbohydrates is equal to, or even rather less than, that of the tobaccos examined.

Generally speaking the tobaccos examined by the author appeared to him to be intermediate to the "makhorta" variety and other tobaccos.

315 – **Freezing Point Lowering of the Leaf Sap of the Horticultural Types of *Persea Americana*: Experiments made in America.** — HARRIS, ARTHUR J. and PORTER WILSON, in *Journal of Agricultural Research*. Vol. VII, No. 6, pp. 261-268. Washington, D. C., 1916.

The introduction of tropical economic plants into the warmer portions of the United States, which for the most part are not free from occasional frosts, depends upon the ability of the species to survive transient low temperature. Among the factors to which frost resistance in plants is due, the magnitude of the depression of the freezing point of the cell sap has been suggested as one of importance. The type in which the expressed sap freezes at the highest temperature is the least capable of enduring cold.

The avocado, *Persea americana* Miller (*P. gratissima* Gaertn) is a very suitable subject for these experiments. It was introduced into Florida and California some years ago, but has only been propagated asexually since the beginning of the present century. Hence, the number of horticultural varieties is not very great. The following 3 types may be distinguished:

1) *Mexican Type.* Very common thoughout the high lands of Central and Northern Mexico. On account of its superior hardness, this

TABLE I. — *Comparison of the freezing-point lowering values of three types of Persea americana (P. gratissima).*

Depression of freezing-point °C	Guatemalan type	Mexican type	Guatemalan and Mexican type	West Indian type
91–0.95	—	—	—	—
96–1.00	—	—	—	2
01–1.05	—	—	—	4
06–1.10	1	—	1	6
11–1.15	—	1	1	1
16–1.20	1	1	2	1
21–1.25	1	1	2	3
26–1.30	—	5	5	—
31–1.35	2	—	2	—
36–1.40	4	3	7	—
41–1.45	—	2	2	—
46–1.50	—	—	—	—
	9	13	22	17

pe has been extensively planted in California and Chili. In Florida, it s fruited as far north as Gainesville and it is also grown in Italy and geria. The Mexican type flowers in California from January to March, d bears ripe fruit from June to October. It can withstand temperatures — 6.7° C. to 8.9° C. (as was shown in January 1913).

2) *Guatemalan Type.* This is indigenous in the mountainous parts Guatemala and the Southern regions of Mexico, whence it was introced into Hawaii, California and Florida. In the latter country, it wers from March to May; the fruit matures in the winter or spring of e following year. It has been found considerably hardier than the est Indian type, but is somewhat more delicate, as a rule, than the exican avocado.

3) *West Indian Type.* — Grows in the West Indies, Colombia, Venezela, Brazil, Peru and Yucatan, also in the Mexican lowlands. In South orida, it is the principal type cultivated, having probably been introced there from Cuba. It is particularly susceptible to low temperatures.

The writer found that there was considerable difference amongst ese 3 types of *Persea americana* as regards the lowering of the freezing int of the sap expressed from the leaves (See following Table). The erage freezing point depression in the Guatemalan and Mexican types is actically the same (the difference is only 0.001 ± 0.029 of a degree) d remains on an average below 1.21° C. The West Indian type is charac-

terised by a distinctly lower average (below 1.2° C.) than the others. This difference holds with remarkable constancy not withstanding the wide geographic origin — West Indies, Bahama, Central America, Mexico and Hawaii — of the plants examined.

From the evidence presented in the paper, it seems highly probable that in the case of tropical perennials, a knowledge of the freezing-point lowering of the sap would be of some service in predicting their ability to withstand cold and in determining the northern limit of their cultivation.

316 - **Germination of the Seeds of *Lepidium sativum* in Solutions of Electrolytes.** — LESAGE, PIERRE, in *Comptes Rendus des Séances de l'Académie des Sciences*, Vol. 164, No. 2, pp. 119-121. Paris, Jan. 8, 1917.

The author noted that, in dilute solutions of various salts (chlorides, nitrates, sulphates of sodium, potassium, ammonium), the seeds of *Lepidium sativum* continue to germinate up to a certain limit of concentration of about 0.4 gram-molecules per litre. In a recent note (1), he showed that the osmotic force of these solutions plays an important part in this germination. Since then he has obtained results from new experiments which, while accounting for the dissociation, seemed to lead back to this conception of the important part played by osmotic pressure on these saline solutions, at the beginning at least, of germination.

Supposing that osmotic pressure has an effective action only at the beginning of germination, the seeds will begin to sprout in solutions which become less and less dilute till they reach the limit at which they will be isotonic, whatever the salt may be, and the common osmotic pressure may be expressed by $M \times 22$, where M represents the same number of gram-molecules or the same fraction of the actively osmotic gram-molecule and 22 the osmotic pressure in atmospheres corresponding to 1 gram-molecule per litre.

Seeds were put to germinate in thin layers of sodium chloride and glycerine solutions, placed in sufficiently large series. Limits of germination were found which were expressed by m for glycerine and n for sodium chloride, m and n representing the fraction of a gram-molecule, of the bodies dissolved in 1 litre.

If dissociation did not take place and if germination depended only on osmatic pressure, $m \times 22 = n \times 22$, and $m = n$ should be obtained. Experiments give the result $m = 2n$. Glycerine, however is a non-electrolyte and non-dissociable, and sodium chloride is a electrolyte and dissociable; the osmotic pressure of glycerine can be expressed by $m \times 22$, that of sodium chloride differs from $n \times 22$. To appreciate this last factor, the quantity dissociated into Na-ions and Cl-ions is expressed by q; the intermediate osmotic values are: $n - q + q + q = n + q$. On the other hand the dissociation of sodium choride is said to be very great, almost complete. Assuming it to be complete, $q = n$. Under these conditions the intermediate osmotic values for NaCl are no longer $n \times 22$, but $2n \times 22$, and the isoto

s expressed by $2n \times 22 = m \times 22$, where $m = 2n$ corresponds to practical results and shows that the beginning of germination depends immediately on the osmotic pressure of the solutions, whatever the dissolved body may be.

In the case of the salts mentioned above, the dissociation of the chlorides and nitrates into 2 ions differing from that of the sulphates into 3 ions must be taken into account. Above all, the limits of germination must be well defined. The results of experiments now being carried out lead the author to suppose that, if the amounts of salt dissolved per litre are represented in fractions of gram-molecules, the following values would be obtained for the end solutions of germination: *a* for NaCl, *b* for KCl, and *c* for $K_4 Fe Cy_6$, such as $a \left(\frac{21}{48}\right)$ is slightly less than $b \left(\frac{24 \text{ to } 27}{48}\right)$ and $c \left(\frac{10}{18}\right)$ corresponds very closely to $\left(\frac{2 \times b}{5}\right)$, which agrees very well with what is already known of these salts: the chlorides dissociate into 2 ions, NaCl into a greater quantity than KCl, and potassium ferrocyanide into 5 ions.

In the same experiments now in progress ethyl alcohol, glycerine and sugar are used as non-electrolytes. At present, solutions of these bodies do not give equal satisfaction.

From the results obtained it would seem possible to use seeds of *Lepidium sativum* for verifying doubtful cases of dissociation in estimating the degree of dissociation or the osmotic pressure of certain liquids. These seeds are easier, both to handle and to observe, than isolated cells or tissues studied under the microscope.

17 - **The Function of Flavones in Plants.** — SHIBATA, K. and NAGAI, I., in *The Botanical Magazine*, Vol. XXX, No. 352, pp. 149-178. Tokyo, April 1916.

The result of a large number of researches and experiments undertaken for the purpose of determining the presence of flavons in plants and the part they play (1).

The percentage of flavones is estimated from the intensity of the red colour produced by the reduction of the extract. In this way, 6 degrees of intensity (in decreasing order) are distinguished (I-VI) which correspond to the same number of degrees of concentration in the cell sap:

I = 1 : 1 000	IV = 1 : 5 000
II = 1 : 2 000	V = 1 : 10 000
III = 1 : 3 000	VI = 1 : 20 000

In Table I, 199 plants of the Island of Formosa, and 80 of Micronesia are divided according to their flavone content.

(1) See *B.* February 1917, No. 120. (*Ed.*).

TABLE I. — *Flavone Content of Plants of Formosa and Micronesia.*

Flavon Content	Plants of Formosa			Plants of Micronesia
	North	South	Total	
I–II	48 (34.4%)	25 (44.2%)	73 (36.9%)	48 (59.5%)
III–IV	44 (31.4%)	16 (28.1%)	60 (30.3%)	16 (20.3%)
V–VI	33 (23.6%)	12 (20.3%)	44 (22.7%)	13 (16.5%)
Less than: 20 000	15 (10.7%)	6 (10.5%)	21 (10.6%)	3 (3.7%)
Totals . . .	140	59	199	80

The figures outside the brackets show the number of plants possessing the given flavon content.

Table II gives the data as to the amount of flavones present in th different organs, or parts, of the plants.

As regards the origin of the species, the highest flavone content is foun in tropical Micronesia, the values being almost identical with thos recorded for Alpine species (growing in the highest zone). In the Island o Formosa (sub-tropical zone), a perceptible decrease is already observed especially in the northern section, in both wild and cultivated plants.

The material collected not only proved the frequent occurrenc of flavones in plants, but also furnished the necessary means for studyin the special function of these substances — the protection of the plant fro excess of light. The most noticeable effects of too great insolation ar the destruction of the chlorophyll and the decoloration of the leaves Therefore, in the hottest and most exposed parts of the tropics, it is by n means unusual to find trees with almost completely white leaves, as fo example, *Pisonia alba*. Plants usually protect themselves from the direc rays of the sun by different means such as: thick down on the leaves rolling or folding their leaves, disposing their leaves in such a manne that the surfaces of the latter are parallel to the direction of of the rays It must, however, be remembered that all these protective devices tend also to limit transpiration, and thus exercise a double function of which it is difficult sometimes to determine the limits and the signification.

The flavonic glucosides dissolved in the cell sap have, on the other hand, a much more evident and specific protective action, for they absorb the rays of short wave length which are so destructive to the chlorophyll corpuscles and enzymes.

Mangroves and plams are, undoubtedly, the most suitable trees fo growing in full sunlight in very sunny localities. Mangroves of the genera *Brugiera, Rhizophora, Kandellia, Avicennia Lumnitzera* and *Sonneratia* contain, without exception, a large amount (1 : 2000 — 1 : 1000) of flavone in their leaves and in the cortical tissue of their aerial roots.

In the hypocotyls of the well-known "viviparous" embryos of *Rhizophora mucronata* the flavon content decreases as we pass from the superficial to the more deeply seated tissues. This is shown by the following figures:

Tissue	Flavon Content
Epidermis and superficial cortical layers. .	II = 1 : 2 000
Cortical parenchyma.	IV = 1 : 5 000
Central cylinder.	VI = 1 : 20 000

There are many species of palm trees which, though they possess thick leaves capable from their structure of resisting external agents, are nevertheless supplied with large amounts of flavons.

TABLE III. — *Decrease of flavons in plants kept in a Greenhouse.*

Genera and species	Plants grown in Formosa	Plants grown in Tokyo	
	in the open	in greenhouse	in the open in summer
Carica papaya	II	traces	—
Coffea arabica	(+) II	V	—
Dracaena	II	traces	—
Nepenthes	(+) I	V	—
Erythroxylum Coca	(+) I	—	(+) I
Mangifera indica	II	—	I
Nephelium Longana	IV	—	IV
Hibiscus Rosa Sinensis	III	—	traces

Even under the climatic conditions of Tokyo, the writers found a large quantity of flavons in the palms *Caryota urens*, *Livistonia sinensis* and *Calamus Margaritae*, which only require protection from the cold in winter; while those kept always in the greenhouse, such as *Raphis flabelliformis* and *Didymosperma Engleri*, contained scarcely any flavons

This phenomenon occurs also in other trees (see Table III): the longer they are kept under glass, the more the flavon concentration decreases, for the function of these substances is rendered useless by the glass of the hothouse which absorbs most of the most dangerous solar rays. In the same way, plants with a very thick cuticle serving itself as a protection, only contain very small quantity of flavons. This occurs in the case of: *Yucca gloriosa*, *Agave vivipara*, *Fourcroya gigantea*, *Epiphyllum truncatum*, *Euphorbia Tirucalli*, several species of *Ficus*, etc. It has frequently been stated that flavons can be easily transformed into anthocyanins and *vice-versa*. Young buds, especially in tropical regions, are often of a fine red-blue colour (anthocyanin), which subsequently, as the growth of the

vegetative organs proceeds, disappears and gives place to coloured flavonic glucosides. On the other hand, it often happens that the latter substances are again transformed into anthocyanin shortly before leaf fall.

The most important fact, and the one which presents a distinct physiological character is, without doubt, the presence of flavons in the tissues. Their temporary transformation into anthocyanin is certainly a secondary phenomenon, a biochemical process determined by the predominant influence of special external or internal conditions.

318 - **The Action of Non-Nitrogenous Reserve Substances in Trees.** — ANTEVS, ERNST, in *Arkiv for Botanik*, Vol. 14, No. 3, pp. 1-23. Stockholm, 1916.

This study on the nature, action and equilibrium of reserve substances in trees has lead to important results, in some cases quite opposed to theories and ideas accepted hitherto. The experiments were carried out during the period from the 10th. March to the 11th. May, 1915, and the calculations made successively at intervals of 6 to 8 days. The reagents used were, Soudan III for fats and iodized zinc chloride for starch.

A NEW FAT RESERVE SUBSTANCE. — FISCHER divides trees into 3 categories:

1) "Trees with fats" in which, towards the end of autumn, all the starch disappears and changes to fats, and to a very light degree, to glucos (corresponding to the bark). The following species of this category were examined: — *Pinus* sp., *Sorbus aucuparia*, *Tilia* sp., *Alnus* sp., *Betu* sp., *Picea* sp. and *Salix caprea*.

2) "Trees with starch" in which, towards the end of autumn only the starch of the bark disappears whereas that contained in the wo remains intact: *Ulmus* sp.,

3) In *Prunus Padus* intermediate phenomena occur.

Certain authors had already maintained that certain unknown non-nitrogenous reserve substances exist. The present work confirms this hypothesis. Certain trees with fats, such as those of the *Alnus* variety, may, in winter, lose all their ordinary fat and starch, and yet possess a certain fatty substance which, when acted upon by Soudan III, turns straw-yellow or yellow-brown. Other species (*Salix caprea*, *Prunus Padus*) also contain a large amount of this new substance as well as the typical fatty substance and starch. When the starch regenerates, this substance is transformed partly into fat and partly into starch.

RELATION OF THE DIFFERENT RESERVE SUBSTANCES TO EACH OTHER.

The appearance and dissolution of the starch and fat in fruits and seeds bear testimony to a constant relation between the two substances; in certain cases there exists a real physiological equilibrium between the fatty substances and the starch, although this is of a very complicated nature. The author acknowledges the existence of an identical state of equilibrium in all those reserve substances capable of transformation, such as

Variety of plant and Date of observations *	Starch				Fatty substances			
	Bark		Wood		Bark		Wood	
	External part	Internal part	Medullary Rays	Medulla	External part	Internal part	Medullary Rays	Medulla
Pinus								
16 March	0	0	0	0	10	9	9	9
22 »	0	0	0	0	10	9	9	9
30 »	0	2	2	4	6	3	5	4
5 April	6	6	3	4	2	3	4	2
12 »	0	1	3	—	2	3	3	4
19 »	5	2	1	4	5	4	4	5
27 »	3	3	3	4	4	2	4	5
5 May	6	6	3	0	1	2	3	3
16 »	6	4	2	5	5	3	4	4
Ulmus								
16 March	0	0	9	10	7	5	0	0
22 »	0	0	9	10	7	5	0	0
30 »	0	3	8	10	6	5	0	0
5 April	1	1	7	10	3	3	0	0
12 »	0	2	2	4	2	2	0	0
19 »	3	1	0	0	3	2	0	2
27 »	1	1	4	6	0	1	0	0
5 May	4	2	4	—	2	2	0	1
11 »	0	0	0	0	2	1	0	0

* The figures from 1 to 10 show the relative amount of the different substances.

fatty substances, starch, glucose, etc. whose transformation would be regulated by special enzymes. The variations in behaviour and proportion between these substances would be due to the fact that certain species contain this enzyme and others do not. The trees with starch would not contain the enzyme which causes it to be changed to fatty matter. This enzyme may always disappear when the environmental conditions are modified. *Prunus Padus* which, in Central Europe and Denmark is a typical starch tree, passes, in Sweden, to the intermediate category, in which partial dissolution of the starch takes place.

Transformation of Reserve Substances According to the Climate.

The commencement of the circulation of the fat and the reappearance of the starch in spring are closely connected with the course of the meteoro-

logical factors. In 1913, the unexpected return of the fine weather with warm, sunny days caused a rapid renewal of these phenomena, whereas the cold and rain of April 11th. to April 12th. caused the newly-formed starch to dissolve with a consequent increase in the fat content (*Pinus*, *Picea*). (See the appended table). If the results obtained by the author are compared with those in Central Europe it will be seen clearly that the transformation into fatty matter during the winter becomes more complete as the altitude increases. Only the effect of climate can cause this phenomenon. There are practically no data for the tropical regions, but it may be admitted that, in proportion as the equator is approached, so the starch tends to dissolve less and less till, in the hottest zones it ceases to dissolve at all.

In addition to the action of climate, the phenomena of growth have a decided influence on the transformation processes, which are closely connected with the automatic return and cycle of the periods of rest, which, up to a certain point, are independent of the variations of climate.

Biological Rôle of the Fatty Substance in Winter.

According to Fischer, the transformation of starch into fat serves to protect the protoplasm against low temperatures. In trees of the same species the process of transformation becomes more and more complete as the north is gradually approached. Whereas, in winter, the wood of trees bears thermic depressions as great as − 30° C., a drop of − 8° to − 10° suffices to cause congealment in summer. The greater resistance of trees during winter may be explained by the presence of fats.

319 - **The Effects of Manganese and Iron on the Growth of Wheat.** — Tottingham, W. E. and Beck, A. J., in *The Plant World*, Vol. 19, No. 12. pp. 359-370, 2 Fig. Baltimore, December 1916.

These experiments were carried out for the purpose of studying the antagonism between manganese and iron in the growth of wheat and the effect of manganese and ferric chlorides upon young wheat plants in water cultures: (iron-free Knop's solution with monopotassic phosphate), the 2 above-mentioned salts being used at 2 concentrations, M/1000 and M/ 100 000

After 3 weeks of growth, the plants were removed from the culture vessels, the approximate length of roots was then obtained by computing the average length of the 2 or 3 longest groups of roots. The tops and the roots were then separated, dried at about 98° C. and weighed.

In the 1st. series of experiments, the two chlorides were added, together, or separately, to the nutrient solution. The results obtained are given in Table I and prove the following points:

1) *In the case of the root system*, manganous chloride, even in small quantities, is injurious and entirely neutralises the positive effects of the ferric chloride. The latter substance used alone seems to promote the length of the root (relative length 101) but when supplied jointly with manganous chloride the relative root length was only 77.

TABLE I. — *Results of the* 1st. *Series of Experiments*

	Control (Knop's solution)	Manganous chloride (low per cent)	Ferric chloride (low per cent)	$Mn Cl_2$ and $Fe Cl_3$ (low per cent)	$Mn Cl_2$ (high per cent)	$Fe Cl_3$ (high per cent)	$Mn Cl_2$ and $Fe Cl_3$ (high per cent)
y *tops.*							
Absolute weight	350 mg.	490 mg.	785 mg.	495 mg.	360 mg.	325 mg.	305 mg.
Relative weight (control = 100) . . .	100	140	224	142	103	93	87
y *roots*							
Absolute weight	230	210	330	230	170	135	145
Relative weight (control = 100) . . .	100	91	144	100	74	59	63
hest *roots.*							
Maximum length	198 mm.	173 mm.	200 mm.	153 mm.	183 mm.	63 mm.	60 mm.
Relative length (control = 100) . . .	100	87	101	77	92	32	30

TABLE II. — *Results of 2nd series of Experiments.*

	Control	$Na H CO_3$ (low per cent)	$Na H CO_3$ and $Mn Cl_2$ (low per cent)	$Na H CO_3$ and $Fe Cl_3$ (low per cent)	$Na H CO_3$ $Mn Cl_2$ $FeCl_3$ (low per cent)	$Na H CO_3$ (high per cent)	$Na H CO_3$ and $Mn Cl_2$ (high per cent)	$Na H CO_3$ and Fe C (high per cent)	$Na H CO_3$ $MnCl_2$ $FeCl_3$ (high per cent)
tops.									
bsolute weight . .	621 mg.	632 mg.	453 mg.	647 mg.	566 mg.	260 mg.	250 mg.	854 mg.	725 mg.
elative weight (control = 100). . . .	100	102	73	104	91	42	40	138	117
roots.									
bsolute weight . .	221	228	185	249	191	163	117	210	195
elative weight (control = 100). . . .	100	105	84	113	87	74	53	95	88
sh *roots.*									
aximum length . .	275 mm.	233 mm.	278 mm.	265 mm.	195 mm.	251 mm	233 mm.	260 mm.	298 mm.
elative length (control = 100) . . .	100	85	101	96	107	84	85	95	108

At higher concentrations, both salts have a toxic effect. Attention is articularly called to the prevalence of the toxic effect of iron over manganese.

2) *In the case of the aerial portions of the plants:* small quantities of manganous chloride instead of having a depressing effect, seem to stimulate he plant to more rapid development. The same antagonism between the chlorides which was observed in the case of the roots was noticeable. A nd series of experiments was made for the purpose of determining whether he toxicity of ferric chloride was due to the acidity known to result from ydrolysis of this salt. In order to maintain neutrality, sodium bicarbonte (in solutions of N/333 and N/33 333) were added, either with, or without,

the 2 chlorides. As is shown by Table II, manganous chloride in the presence of bicarbonate of sodium, even in small quantities, is injurious both to the roots and the green portions of the plant.

At high concentrations, sodium bi-carbonate exercises a distinctly toxic effect, while ferric chloride, contrary to what was observed in the first series of experiments, stimulated the growth of the tops of the plants. This was evidently due to the alkalinity of the nutrient solution.

320 - **The Suppression of Characters on Crossing.** - BIFFEN R. H., in *Journal of Genetics* Vol. 5, No. 4, pp. 225-228. Cambridge, July 1916.

The well-known Rivet wheat (*Triticum turgidum*) belongs to the grey-chaffed varieties; greyness, up to the present, is invariably associated with the presence of silky hairs on the glumes, so that all grey wheats are "rough-chaffed".

The writer crossed *Triticum turgidum* with *T. polonicum* (Polish wheat) a varety distinguished by the enormous length of its white, slightly hairy glumes which are some three times as long as those of any other wheat. The hybrids of the first (F_1) generation have a pale grey chaff. Isabelline white is probably the most accurate description of the colour. It is not unlike that of Polish wheat, but a faint grey tinge is present, much as there is a tinge of blue in many white-flowered varieties of Campanulas derived from blue species. The grey colour which in crosses with red-chaffed wheats usually is dominant, here on the contrary proved recessive.

In the 2nd. hybrid generation (F_2) there were individuals with the short or long glumes of the parents and a series of plants with intermediate glume length. The short and the intermediate glumes were all markedly rough, whilst the long-glumed forms were practically glabrous (rough chaffed) but all were absolutely white (like *T. polonicum*) and remained so in the succeeding generations. Thus in F_2, in the whole series of plants containing at least 100 000 individuals, there was not one which had coloured chaff. Thus the grey character of Rivet wheat was completely suppressed.

The writer suggests that the suppression of a character on crossing may be connected with the frequent occurrence in the F_2 generation of characters not shown by either of the parents. Thus, red-grained varieties of wheat crossed together frequently produce white-grained forms: in the commonest cases the ratio of red to white is as 15 : 1. The highest frequency with which white can occur in crosses is one in 16. In this case we might speak of the suppression of the red once in 16 times in the F_2 generation.

NILSSON-EHLE suggests that the appearance of new characters is due to there being *various* red-producing factors: C – C_1 – C_2 etc.

In the case of 2 factors, the parents are represented respectively by Cc_1 and C_1c; the hybrids of the first generation (Cc_1 and C_1c) produce 4 kinds of gametes; CC_1 – Cc_1 – C_1c – cc_1 which in the 2nd. hybrid generation (F_2) combine in the manner shown by the following table.

Constitution of hybrids of 2nd. *generation* (F_2) *in the case of* 2 *factors.*

		Male Gametes			
	♂ / ♀	CC_1	Cc_1	C_1c	cc_1
Gametes	CC_1	CC_1CC_1	CC_1Cc_1	CC_1C_1c	CC_1cc_1
	Cc_1	Cc_1CC_1	Cc_1Cc_1	Cc_1C_1c	Cc_1cc_1
	C_1c	C_1cCC_1	C_1cCc_1	C_1cC_1c	C_1ccc_1
Female	cc_1	cc_1CC_1	cc_1Cc_1	cc_1C_1c	$\mathbf{cc_1cc_1}$

hybrids — *Constitution of* — *Constitution of hybrids*

The combination of cc_1 with cc_1 will thus occur only once in 16 times, nd as only 1 factor C is required to produce red, there can be but 1 com-etely white hybrid in the F_2 generation. By assuming the existence of 3 d-producing factors, a ratio of one white to 64 red in the F_2 generation m be accounted for.

The ratio as 1 : 3 has recently been found in a cross between "Square-ead's Master" and a red Chinese wheat which is at present un-entified. The same cross and another between "Squarehead's Master" nd a white Chinese wheat have given bearded plants in the ratio 1 : 3 in e F_2 generation, though both parents are beardless.

It is possible that these cases represent terms in a series beginning ith the total suppression of a dominant character, then its suppression nce in 4 times = once in 16 = once in 64, and so on.

21 – **Sunflower Selection at the District Agricultural Station of Saratov, Russia.** — Сунорову, В. (Souvorov, V.), dans *Журналъ Опытной Агрономіи* (Journal of Experimental Agriculture), Vol. XVII, Pt. 3, pp. 258-280, Petrograd, 1916.

The author quotes the results of sunflower selection (1) published by M. Platchek (Платчекъ Е. М.) and A. I. Stebout (Стебутъ А. И.) in e 5th. Volume of the *Works of the Selection of the District Agricultural ation of Saratov*.

The experiments were carried out during the years 1912-1913 and 914. There are three well-defined groups of cultivated sunflower: — 1) A oup with seeds used as food; 2) A group used for the extraction of oil;

1 Towards 1810 sunflower was only known in Russia as an ornamental plant. It was then tivated in the province of Saratow for its seeds, eaten as a delicacy. A few years later the sant Bokarew, of the province of Voronej, attempted to extract oil from the seeds. This l was found to have an excellent taste and, from that time, the cultivation of the plant began

3) A group intermediary to these two. The second group was that chiefly studied because it is of the most practical importance for the district. The selection work was carried out in two ways: on one hand attempts were made to separate out the varieties on the basis of the external morphological characteristics, and on the other to create new species capable of resisting disease and pests, especially *Orobanche cumana*. The first method failed because it was not found possible to isolate species with a well-defined individuality. The varieties of sunflower now cultivated are almost

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to spread. In 1846, in the neighbourhood of Saratov, 124 acres were sown with sunflower, in 1852, 2420 acres and, in 1853, 3384 acres. In 1913 in the whole Empire the area under sunflower amounted to 2,227,794 acres. The appended table gives details for the production in that year.

CULTIVATION OF SUNFLOWER IN RUSSIA IN 1913.

Districts and Provinces	Area (acres)	Total Production (cwts.)	Yield per acre (cwts)
Koursk	46,879	395,095	7.73
Tambov	125,028	860,951	6.93
Voroneje	606,809	3,767,871	6.21
Saratov	407,079	2,244,609	5.50
Penza	7,174	51,370	7.16
Kherson	20,908	178,591	8.66
Tauride	3,217	20,496	6.29
Iekaterinoslav	19,045	169,826	8.84
District of the Don	89,108	547,773	6.21
Kharkov	91,744	645,677	7.01
Poltava	12,911	121,045	7.32
Total for Russia in Europe	1,130,052	8,027,303	6.70
SOUTHERN CAUCAS.			
District of Kouban	737,603	4,352,756	5.97
Stavropol	20,807	93,239	6.03
Total for Suthern Caucasus	758,410	4,445,995	5.81
RUSSIA IN ASIA.			
District of the Amour	1,604	12,111	7.49
District of Turgaisk	20,826	46,534	2.33
District of Semipalatinsk	3,608	12,850	3.58
District of Semirietchensk	14,045	42,720	4.40
Total for Russia in Asia	60,083	134,215	3.35
Total for the Russian Empire	2,228,545	13,507,513	6.05

In 1913 the total area in which sunflower was cultivated in the whole of the Empire has increased by about 6 % as compared with the previous year. The yield per acre was about 4.53 cwt.

Cf: — 1) *Encyclopédie complete agricole russe*, Vol. VII, p. 394. Petrograd, 1902. A. F. DE VRIEN, editor. — 2) DIRECTION GÉNÉRALE DE L'ORGANISATION AGRAIRE ET DE L'AGRICULTURE *Recueil de données statistiques et économiques sur l'industrie agricole en Russie et dans de pays étrangers*, Year VIII, pp. 126-128 Petrograd, 1915. (*Ed.*)

ybrids, and not subject either to natural or artificial selection. Accord-
o the results obtained by the section, the various species of sunflower
ot show any marked difference one from the other in their external
acteristics during the whole of their vegetative period. Biometric
y, combined with a comparison of their different characteristics, did
lead to the establishment of any distinct types. It was not even
d possible to establish types of sunflower according to the size and
e of the achenes.

It was decided, therefore, not to make any attempt at present at a
ral classification of the sunflower but to make a study of one group of
acteristics of the achene — the colouration. All cultivated sunflow-
may be reduced to a few fundamental types, more or less resistant as
rds the hereditary type of the achene, by the presence or absence of the
ified layer and the colouration of the bands. It was found possible to
blish a certain correlation between the colouration of the achene and
size and shape of the leaves of the plant. Nevertheless the vegeta-
phases of all the types, from budding to complete maturity, were
ost uniform, there did not even appear to be any relation with regard
he type of achene, the length of the stalk, the diameter of the disc, etc.
only clear distinction appeared to be in the closeness of planting,
ch, though the same for each type at the beginning of vegetation, dimin-
d greatly by harvest time in some varieties. This shows that the
ous types studied have a different resistance to unfavourable condi-
s and to disease.

It was found that types of sunflower divided according to the colour-
n of the achene showed a varying susceptibility to *Homœsoma nebu-*
and *Puccinia Helianthi*. From the beginning of the experiments it
noted that samples of the "zelenka" and "americanka" varieties
red less from *Orobanche cumana*, the greatest enemy of the sunflower,
in the following years special attention was paid to choosing and fixing
ties which would possess a hereditary resistance to *O. cumana*. It
observed that the oil types of sunflower separated by the colouration
ne achenes, are distinguished between themselves by their different
e of resistance to *O. cumana* and it was eventually found possible to
blish strains which were not attacked at all by *O. cumana*.

Strawberry Selection in the United States. — DARROW, GEORGE M., in *The Journal of Heredity*, Vol. VII, No. 12, pp. 531-540, 6 fig. Washington, D. C. December 1916.

Of late years, thanks to the efforts of two experts, CLOUD and HUBACH, tion has greatly contributed to the improvement of the strawberry in States of Kentucky, West Virginia, Maryland and Delaware. Two varieties "Payday" and "Perfecto", will be introduced at an early

"Payday" is the result of a cross between "Klondike" and a seedling acterised by an almost complete absence of stamens. It is certainly better of the two new varieties, and is superior to "Klondike" in the ty and colour of its fruit, its productivity, vigorous growth and the er interval between the blossoming time and the ripening of the fruit.

As soon as the petals begin to drop, the flowers stems curve dow wards, in such a manner that the fruits are protected by the folia from frost, cold winds and rain. Another good quality possessed by t "Payday" variety is acidity which, without altering its flavour, allo of its bearing packing and transport better.

Up to the present, Mr CLOUD has obtained the following varieti by crossing:

Varieties.	Parentage.
Cloud	Crescent × Wilson.
Big Bob	Cumberland Triumph × Neuman
Lulu	Crescent × Neuman.
Pickerproof	Lulu × Hoffman.
Klondike	Pickerproof × Hoffman.
Payday	Unnamed seedling × Klondike.
Perfecto	Unnamed seedling × Klondike.

The method adopted by another strawberry breeder, Mr HUBA is interesting. He grows in a separate plot 4 plants of each pistill variety which he wishes to use. When a cross is to be made, a flo from a plant having perfect bloom and ripe pollen is placed in an inver position on one of the flowers of the pistillate plant. The operation sho be effected early in the morning and it succeeds well. Seed from resulting berries is collected and kept for 1 year. During this time, weaker seeds are killed. The seed is soaked in water for 3 days and t planted about the middle of May in sterilised soil composed of half sand; half well-rotted stable manure. When the plants have 3 or 4 leaves, th with undesirable characters are discarded. Correlation of characters ma it possible to discard most of the undesirable ones at this time. Wh the fruit is ripe, Mr. HUBACH selects the best plant; if it lacks some i portant character, he crosses it on one of the pistillate varieties wh will supply the missing quality. Following this plan, he has secure variety, the "Famous", which possesses the desirable characters "Klondike", but is better in some respects. It ripens 2 weeks ear than the Klondike, and is slightly earlier than the Excelsior. As a r the "Famous" variety bears one berry to each stem, the fruit is lar than that produced by "Klondike" and is very uniform through the season. If it proves generally as productive, firm, and free fr disease as it has shown itself on Mr. HUBACH'S estate, it should be valuable addition to the list of varieties for the south.

By means of suitable crossing, Mr. HUBACH is trying to produce a riety as late as the "Aroma", but with the desirable characteristics of "Klondike".

In addition to Messrs. CLOUD and HUBACH, other Southerners h contributed to the development of the strawberry industry. Thirty ye ago there were practically no strawberries exported from the south. 1914, the shipments of fresh strawberries in the United States total 14 553 carloads. Of these, 8 369 carloads came from the southern St

nd largely from sections to which the strawberry is not native. Of the otal acreage planted with strawberries in the south the "Klondike" variety ccupies 79 %, the "Aroma" 8 % the "Missionary" 7 %, the "Gandy" % the "Excelsior" 2 %, the "Thompson" 1 %. On the remaining % are grown the following varieties: Hathaway, "St. Louis", "Mitchel", "Jamestown", Dixie", "Ogark", "Neuman" "Nick Ohmer" Market", "Eureka" "Mellie", "Champ Clark", "Bubach", Hefflin", "Three W", and "Corneille". The data given in the table f the article show that practically all the varieties grown in the South riginated there. Certain of these varieties are also grown extensively elsehere, thus "Klondike" is the leading type in California and Illinois. The reeders of the South say that the ideal strawberry of the future should ossess the following qualities: 1) the plant should be as disease resistant s the "Aroma"; 2) it should make runners as freely as the "Klondike" r "Aroma"; 3) it should be, at least, as productive as the most productive ariety in each section; 4) it should have a perfect flower; 5) the blosoms should be as well protected from frost as those of the "Missionary";) the berries should be as uniform in size throughout the season as the uit of the "Aroma" and "Chesapeake"; 7) the berry should be as niform in shape as the "Chesapeake" in sections to which it is best dapted; 8) the berry should be as firm as the "Klondike"; 9) the erries should be as easy to pick as the "Klondike" have as red a flesh s the fruit of the latter variety and be at least as large. These are the eneral characters aimed at, but they can be modified to meet local emands. Thus in some districts, the growers must have a very early ariety which can be gathered in good time, so as not to interfere with ter agricultural work. Canners prefer varieties with fruit of a deep red olour, which is easily removed from the stem and retains its shape after ooking.

The work of selection, if carried ont scientifically and methodically, ill gradually make it possible to obtain the type of strawberry best dapted to the climatic conditions and commercial requirements of the ifferent districts.

13 - ***Pyronia*, a Hybrid Between the Pear and Quince**. — TRABUT, L., in *The Journal of Heredity*, Vol. VII, No. 9, pp. 416-419, Fig. 2., Washington D. C. September 1916.

In 1913, VEITCH, of London, succeeded in obtaining a hydrid between *yrus* (pear) and *Cydonia* (quince). This creation, which he called *Pyonia* was a very ornamental plant, but it ripened no fruit in England. In rder to correct this defect, the writer carried out his experiments in a warm climate, that of Algeria. He grafted the *Pyronia* scions on a Moroccan pear (*Pyrus gharbiana* Trabut) and in November of the same year, 1913), they were 2 metres long and as large as a thumb at their base. n 1914, the first fruits appeared, and in the spring of 1915, the plants owered abundantly and set a large quantity of fruit. The writer gave this variety the name of *X Cydonia Veitchii* var. John Seden.

It may be described as follows:

Leaves light green, with a vernation intermediate between the conduplicate vernation of *Cydonia* and the involute vernation of *Pyrus*, for while one side of the leaf blade is inrolled as in the pear, the other side, instead of being inrolled symmetrically, encircles the first completely.

The *flowers* are produced in clusters of 3 at the end of the branchlets; with few exceptions, each flower produces a fruit. A second period of flowering occurs after the first, the flowers are solitary and appear at the end of the branchlets, they also produce fruits, and at the beginning of autumn there is a third period of flowering but the fruits formed do not ripen.

The *fruits* ripen in October and November; during the early stages of their development, the 2 rows of ovules are to be clearly seen in each loculé, but later, they disappear. The form of the fruit is characteristic, cylindrical, slightly longer than broad with a short peduncle and persistent calyx lobes. The flesh is sweet, granular, firm, juicy, slightly acidulous with with an agreeable quince-like perfume.

VEITCH places this hybrid in a new genus *Pyronia*. This new genus created by hybridisation may be maintained without inconvenience, at least by horticulturists, if not by botanists who follow a fixed code of nomenclature.

From the fruit-grower's point of view, *Pyronia* is most satisfactory, and if it were still further improved and cultivated, it would give excellent results througout the Mediterranean region.

324 – **Variations of a Sexual Hybrid of the Vine obtained by Grafting it on One of its Parents.** — BACO F., in *Comptes Rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 163, No. 23, pp. 712-714. Paris, Dec. 4, 1916.

About 10 years ago LUCIEN DANIEL in his studies on the grafting of herbaceous plants (1) drew attention to the modifications produced by symbiosis in the stock and scion. In particular he showed that by performing grafts on suitable stocks it was sometimes possible to bring about a disjunction of parental characters, to change the aspect of the character-mosaic by strengthening or weakening certain specific properties and even to cause the appearance of new characters.

By applying this theory A. JUBIE (2) and P. CASTEL (3) improved their sexual hybrids and obtained, by grafting, hybrids which have made their mark in vine cultivation.

(1) LUCIEN DANIEL: "La variation dans la greffe et l'hérédité des caractères acquis"; in *Annales des Sciences naturelles, Botanique*, 1898. – "Variations des races de haricots sous l'influence du greffage" in *Comptes Rendus de l'Académie des Sciences*, Vol. 130, p. 1015, etc., 1900.

(2) A. JUBIE: "Sur un cas de déterminisme sexuel produit par le greffage mixte" in *Comptes Rendus de l'Académie des Sciences*, Vol. 133, p. 445; 1901. – "Un nouveau cas de variation de la vigne à la suite d'un greffage mixte," *Ibid*, p. 1246.

(3) P. CASTEL: "De l'amélioration des producteurs directs par la greffe (*Comptes rendus Toulouse*, 1904).

After the deaths of JURIE and CASTEL the author (1) attempted to improve
the same method the sexual hybrids of the vine which he had created, and
tained sexual-asexual hybrids much superior to the original plants. In
16 he observed a remarkable transformation of his hybrid 11-16, involving
anges in the mosaic and the appearance in the scion of latent character-
tics derived from the stock and one of its maternal ancestors. The hybrid
-16 is descended from a cross made in 1907 between 24-23 BACO (Folle
anche × *Riparia*) as male parent and 4-13 BACO (Sauvignon × 4401
OUDERC) as female parent. In this hybrid the paternal characteristics
e predominant. In size, appearance and form, the leaf resembles that
24-23, the length of the petiole varies from 1 $^1/_2$ to 3 inches and is red
colour; the lamina is American in appearance, without any well defined
cisions; it is smooth, with slightly hairy ribs, 4 $^1/_4$ to 4 $^3/_4$ inches long
d 5 $^3/_4$ inches wide at the most. The petiolary sinus is obtuse, and the
visions of the leaves only slightly incised. The clusters are loose, small,
th a limited number of black grapes, with hard, rather "foxy" flesh. As
rule they contain only one seed which is fairly large, with a short, full tip
the American type.

In 1912 the author grafted 11-16 on to one of its parents, 4401 COUDERC
hasselas rose × Rupestris), with incised leaves and rather blunt teeth,
e the Chasselas, which is remarkable for the length of its red-brown pe-
ole (5 inches). No grafted plants preserved the characteristics of the parent
ock, and one of them was completely changed. The petioles of its leaves
ngthened, as in Chasselas, and reached a length of from 2 $^3/_4$ to 4 inches;
e lamina changed in shape and attained a length of from 3 to 4 inches,
acquired the incisions of a *Vitis vinifera* whilst still preserving the smooth-
ss of American vines, its petiolary sinus narrowed as in the parent French
nes. The length of the inter-nodes of the stalk remained smaller; the
lour and striation also changed. The cluster became wider and twice as
ng; the grapes, numerous and close, as in the case of the ancestor Sauvignon
came bigger, more tender, more juicy and lost the foxy taste. The ana-
mical structure also showed an accentuation of the characteristics of the
ench vine. Briefly, the vegetative and reproductive organs had been in-
enced simultaneously by 4401, a stock which had accentuated the an-
stral characteristics common both to the scion and to itself, and, in the
w graft hybrid, had brought them from the latent state to the dominant
te. Number 4401 had reproduced in the scion 11-16 qualities much su-
ior for the production and value of grapes (qualities derived from Chasse-
and Sauvignon) without detracting from its resistance or vigour (qualities
rived from *Riparia* and *Rupestris*).

This example confirms the results obtained by DANIEL JURIE and CASTEL,
d shows once more that grafting is, in some cases, a very powerful agent
variation, capable, in the case of sexual hybrids of changing the latency

(1) F. BACO: "Sur des variations de vignes greffées", in *Comptes Rendus de l'Académie Sciences*, Vol. 148, p. 429; 1909 — "Bouturage compare de vignes greffées et de vignes ches de pied," *Ibid.*, Vol. 156, p. 1167 — etc. 1913.

or dominance of characters common to the ancestors of the scion and the stock. In the new grouping of the character-mosaic which results from the influence of a sexual hybrid by grafting it on one of its parents, there may be an improvement without deterioration from an utilitarian point of view, as in the case of the graft-hybrid 11-16 obtained by the author. On the other hand, inverse results may be obtained. The importance of the choice of subjects cannot, therefore, be too much emphasised, when it is desired to improve a sexual hybrid of the vine by grafting, and thus separate antagonistic elements.

325 - **Varieties of Hungarian Wheat Selected to Increase the National Production** (1)

GRABNER EMILE, in *Köztelek*, year 26, No. 41, pp. 1459-1460, Budapest, October 7, 191

The numerous experiments carried out in the various districts of Hungary show that Hungarian wheat selected by Mr. SZÉKÁCS at Arpádhalom since 1905 surpassed all other native improved varieties, not only in its yield but also in its resistance to rust and in its sturdy straw. In order to assure a good harvest and to increase national production attempts have been made during the last two years to replace local native wheat by the more productive Arpádhalom variety, not only on large estates, but on property belonging to small landowners. According to the author, an area of over 852 89 acres would be sown in the autumn of 1916 with the best type of Arpádhalom. This area would be the property of small landowners, whose low production usually diminishes the average yield of the country. This represents a great step foward, especially considering the fact that $^3/_4$ of the land under wheat belongs to very conservative small farmers, who, except in some districts, have not yet effected this substitution. Moreover, it is only by increasing the production on this land that the maximum yield for the whole country may be assured.

It was with this end in view that, in the autumn of 1915 Mr. PORSZ head of the Royal Agricultural Survey of Mosony distributed 28.5 loads of Arpádhalom seed among 395 small landowners in 25 districts. Before distributing the seed popular lectures were held on the productive value of the wheat in question and on the proper method of cultivation of selected wheat. The landowners were also invited to carry out comparative experiments with local native seeds and to collect the results obtained. Only 72 reports have so far been sent to the Survey Office, but their recognition of the good qualities of the best type of Arpádhalom seed is unanimous. The yields in grain were as follows.

District	Yield in cwts per acre
1	$6\,^3/_4$
1	$6\,^3/_4 - 8\,^3/_4$
2	$8\,^3/_4 - 9\,^1/_2$
9	$9\,^1/_2 - 11$
19	$11 - 12\,^1/_2$
19	$12\,^1/_2 - 13\,^3/_4$
19	$13\,^3/_4 - 15$
2	$16\,^1/_2 - 27\,^1/_4$

(1) On this subject see — B. 1913, Nos. 353 and 1333 — B. 1914. Nos 224 and 421 — B. 1915, N. 166. (*Ed.*)

Farmers who, in one district, harvested 7 to 8 ½ cwts per acre, ob-
ned in others 14 cwt per acre, which shows that smaller yields must be
ributed to unfavourable climatic conditions. Those who carried out
nparative experiments obtained an average increase of 3 cwts per acre
favour of the selected wheat; under favourable conditions there were
reases of from 3 to 9 cwts per acre. These data have a still greater
lue when it is considered that they only represent a part of the land where
ltivation has often been carried out by farm labourers.

It is hoped that within a short time all the ground under wheat in the
osony district will be sown with Arpádhalom seed. In 1915, with the 28.5
ads of seed referred to above, more than 4 166 acres were sown, whose
eld may be estimated at about 24 tons. If, from this total, the amount
ed for other purposes is deducted, the ground sown in 1916 may be esti-
ated at 41 688 acres and would be capable of yielding a surplus of 35 to
tons.

There is no reason why the small landowners of other districts in the
ntry should not obtain a similar increase, and the author appeals to the
horities to assist the small farmers to improve their wheat harvest in
manner described above.

- **Manitoba Wheat in Italy and France**. — SIGNORINI M., in *Il Coltivatore*, Year 63, No. 2, pp. 54-59. Casale Monferrato, 1916.

The term "Manitoba" wheat includes all the types of wheat from
t district. As a rule, amongst wheats from the same district one well-
rked variety predominates, thus, amongst the different varieties of "Man-
ba" wheat introduced into Italy and France, one in particular stands
t. This wheat gives slender, tapering ears, which are only slightly
rded with pointed glumes of a pinkish colour. The characteristics of this
eat are identical with those of *Red Fife*, which is much used in the north
the United States and in Canada. For this reason VILMORIN proposed
call this variety *Fife rouge* instead of giving it the vague name of "Mani-
ba". *Red Fife* is the most widely used and best known of the spring
heats, especially in Southern America, on account of the favourable climat-
c and soil conditions. Before advising the use of Manitoba wheat for
ring crops in Europe it will, therefore, be necessary to select, cross and
udy it. Below is a summary of the results obtained hitherto in Italy and
rance.

ITALY. — STEVANO, who has experimented with more than twenty
rieties of wheat from Winnipeg, the capital of Manitoba, claims to have
nd good types, with small, light, plump grain of medium strength,
me of which may be recommended. As a rule "Manitoba" wheats rip-
at the end June or the beginning of July. They give a fairly profi-
ble yield, with straw of medium height, stronger than that of "Cologna"

In the province of Caserte, CAMPELL carried out an experiment which
ve good results, and he advises the use of "Manitoba" in the south of
aly, especially when it has not been possible to sow the local variety in good
me. Finally, VOLANTI states that, a few years ago, a farmer of Frugarolo

(province of Alexandria) obtained a very fine and very abundant sprin crop of " Manitoba " wheat, freely manured.

FRANCE : — SCHRIBAUX has set on foot an enquiry amongst the farmer who, in 1916, cultivated " Manitoba " which had been supplied by the Gov ernment. Although the crops were very varied, the ears being whit red, bearded or beardless, the opinion of French farmers was, on a whole favourable. It must not be forgotten that :

1) Manitoba gives good results and a harvest which may exceed cwt. per acre even if sowing is late and the local varieties cannot be su cessfully cultivated. Sowing must be abundant in order to countera the limited stooling of the plant. There should be an average of 1 $\frac{1}{2}$ cw per acre.

2) " Manitoba " is strongly resistant to scorching which does much damage to March wheat, and is also resistant to rust.

3) " Manitoba " is strong, very early, and resists sea-winds

4) It should not be sown in clay or naturally moist soils as it the gives bad results.

5) As far as possible the soil should be well manured, as a plan which develops rapidly always needs a fertiliser ; a large yield may thu be obtained.

327 - **Agricultural Procedures for Increasing the Production of Wheat** — DEVAUX, H in *Comptes Rendus des Séances de l'Académie des Sciences*, Vol. 164, N° 4, pp. 1[illegible] Paris, January 22, 1917.

In 1915 and 1916, in the neighbourhood of Bordeaux, the author e perimented in the production of wheat by DEMTCHINSKY's method, that to say, by early thin sowing, continual earthing up and the transplantati of the best plants. He cultivated 4 varieties : — Hybride inversable Vilmorin — Rouge de Bordeaux — Bon Fermier — bearded Rieti. I found that all the wheats grew well under the conditions described abo and produced an extraordinary number of ears. Red Bordeaux, one of t varieties which stools least, produced, on 6 square metres, 177 plants, at average of 0.5 culms per plant, or a total of 1 687 stems corresponding an average of 30 per square metre, with 261 culms of which 116 were pr duced by 6 large plants.

328 - **Cereal Experiments in Montana and in Wyoming, United States.** — I. DEVAUX N. C. Cereal Experiments at the Judith Basin Substation Moccassin, Montana. Un States *Department of Agriculture Bulletin*, No. 378, 41 pp., 17 fig. Washington, October 1916. — II. JONES, JENKIN W. Cereal Experiments on the Cheyenne Experiment Fa Archer, Wyoming, in *United States Department of Agriculture Bulletin* No. 430, 30 pp., fig. Washington, D. C., October 28, 1916.

I. — Co-operative experiments with cereals at the Judith Basin sub station, Moccasin, Montana, United States, have been conducted durin eight years, 1908 to 1915, inclusive.

The Judith Basin substation is located in the west-central part Fergus County, in central Montana. The altitude is 4 300 feet.

The yields obtained at Moccasin are not representative of all the dry

land area, but the comparative results obtained are believed to be applicable in general to all the dry-farming area of Montana.

The annual average precipitation at Moccasin for 18 years, 1898 to 1915, inclusive, is 16.66 inches. The average seasonal rainfall (April to July, inclusive) for the same years is 9.41 inches.

The soil at Moccasin on which cereal varieties have been tested is a dark clay loam of limestone origin.

On the average, satisfactory yields are obtained from winter and spring wheat, spring oats, barley, and flax.

The best winter wheats are the Kharkof and Turkey. These belong to the Crimean group of hard winter wheats.

The best rate to sow winter wheat is 3 pecks per acre. The best date to sow is from August 10 to September 10.

The highest yields of spring wheats have been obtained from varieties of durum wheat. Of these, the Pelissier has been the best. Of the common spring wheats the best variety to grow appears to be the Marquis.

Spring wheats are seeded at the rate of 4 pecks per acre.

The best results are obtained from sowing all spring wheat, oats and barley as early in the spring as soil and climatic conditions will permit.

The highest average yield of oats was obtained from the Sixty-Day variety. This variety averaged about 16 bushels per acre more than later maturing varieties.

The best rate of seeding for the small-kernelled early varieties of oats, such as the Sixty-Day, is about 4 pecks per acre.

The White Smyrna barley, a 2 rowed bearded hulled variety, has given the highest average yield.

The hulled varieties of barley are seeded at the rate of 5 pecks and the naked varieties at the rate of 4 pecks per acre.

The highest yield of flax in a 5 year test was obtained from the Russian variety.

It is probable that the best results will be obtained if flax is sown early, between April 15 and May 1. The best rate seems to be from 20 to 25 pounds per acre.

In pounds per acre, the average yield of the White Smyrna barley is greater than that of the best variety of any of the other cereal crops. The Kharkof winter wheat is second in yield, followed by the Sixty-Day oats, the Nepal naked barley, the Pelissier spring wheat and the Russian flax.

In the value per acre based on the farm price on December 1 of each year, the Kharkof winter wheat leads, followed by the White Smyrna barley, the Russian flax, the Sixty-Day oats, the Pelissier durum spring wheat, and the Nepal naked barley.

Emmer and spelt do not give as good yields as barley and oats.

Proso millet has been tried, but is not a promising crop.

Early varieties of brown kaoliang and broom corn have been tested, but do not mature seed.

Table I gives the average dates of seeding, heading and maturity, days from seeding to maturity, height, yield of grain and straw and weight per

TABLE I. — *Average Results obtained at Moccassin from Heeding to Marvest.*

Group and Variety	C. I. No.	Average date			Seeding to Maturity. Days	Height Inches	Yield per acre		Weight per bushel Pounds
		Sown	Headed	Ripe			Grain Bushels	Straw Pounds	
WINTER WHEAT.									
Alberta Red	2 979	September 1	June 27	August 4	338	39	33.3 (a)	3 292	59.6
Crimean	1 435	*id.*	*id.*	*id.*	338	38	31.9	3 660	59,8
»	1 437	*id.*	*id.*	*id.*	338	39	32.6	3 680	60.1
»	1 559	*id.*	*id.*	*id.*	338	38	30.9	3 690	60.1
Kharkof	1 442	*id.*	*id.*	*id.*	338	38	33.5	3 690	59.6
»	1 583	*id.*	*id.*	*id.*	338	37	35.6	3 550	60.1
Turkey	1 558	*id.*	*id.*	*id.*	338	38	34.1	3 660	60.5
SPRINGWHEAT.									
Durum group:									
Beloturka	1 520	April 24	July 16	August 24	122	43.5	25.8	3 108	59.6
Kubanka	1 440	*id.*	» 17	» 26	124	42.5	25.5	3 073	59.6
Pelissier	1 584	*id.*	» 17	» 26	124	43.0	27.2	2 980	60.0
Pererodka	1 350	*id.*	» 15	» 25	123	42.0	26.8	3 200	59.8
Yellow Gharnovka	1 444	*id.*	» 16	» 26	124	42.6	26.8	3 172	59.8
Fife group:									
Ghirka spring	1 517	April 24	July 17	August 25	123	37.5	23.7	2 576	59.0
Rysting	3 022	*id.*	» 20	» 27	125	39.0	23.1	2 796	59.2
Preston group:									
Pretes	1 590	April 24	July 18	August 25	123	38.0	26.3	3 131	59.4
Marquis group:									

Sixty-Day	105	April 29	July 6	August 7	100	36.5	76.0	2 250	34.6 (b)
Kherson	459	id.	id.	id.	100	36.3	72.5	2 274	34.6 (b)
Midseason white:									
Siberian (c)	741	April 21	July 21	August 15	114	48.0	71.7	3 226	36.6
Swedish Select	134	» 29	» 17	» 16	110	42.0	70.4	2 714	37.0 (d)
Danish	441	» 29	» 17	» 18	111	39.0	67.8	2 513	32.3 (d)
BARLEY.									
Two-rowed hulled:									
White Smyrna	195	April 18	July 6	August 4	108	29	52.9	2 540	48.2
Hannchen	531	» 18	» 11	» 6	110	32	47.9	2 299	48.4
Six-rowed hulled:									
Coast	690	April 18	July 6	August 5	109	32	48.0	2 304	46.0
Mariout	261	» 18	» 5	» 5	109	31	46.8	2 246	46.2
Six-rowed naked:									
Himalaya	620	April 18	July 6	August 5	109	31	31.9	1 904	61.0
Nepal	595	» 18	» 8	» 5	109	32.6	30.2	1 850	61.0
FLAX.									
European seed flax:									
Russian (North Dakota No. 153)	19	May 8	July 19	August 28	112	23.0	17.0	1 624	56.0
Select Russian (North Dakota No. 1215)	3	id.	20	id.	112	23.0	15.8	1 610	56.0
Select Riga (North Dakota No. 1214)	2	id.	id.	id.	112	22.8	15.8	1 456	55.7
North Dakota No. 1221	16	id.	id.	id.	112	22.6	15.6	1 440	55.7
Fargo Common (North Dakota No. 1133)	18	id.	id.	id.	112	22.0	15.4	1 386	55.7

(a) Average for six years, 1910-1915. — (b) Average for five years 1909 and 1911 and 1913 to 1915. — (c) Average for three years 1913 to 1915. — (d) Average for four years, 1910 and 1913 to 1915.

bushel at the Judith Basin substation, Mocassin, Mont., for: seven leading varieties of winter wheat in seven years, 1909 to 1915; nine leading spring-wheat varieties during seven years, 1908 to 1911 and 1913 to 1915 (the height averages are for six years, 1909 to 1911 and 1913 to 1915; the averages of the weight per bushel are for five years, 1910, 1911 and 1913 to 1915); five leading oat varieties during the seven years 1908 to 1911 and 1913 to 1915 (the height averages are for six years, 1909 to 1911 and 1913 to 1915; the straw averages are for five years, 1909 and 1910 and 1913 to 1915); six leading varieties of barley during five years, 1910, 1911 and 1913 to 1915; five leading flax varieties in the five years 1911 to 1915 (the averages of weight per bushel are for the four years 1912 to 1915).

II. — The Cheyenne Experiment Farm is located on the plains of south-eastern Wyoming at Archer, 8 miles east of Cheyenne. The elevation is almost exactly 6 000 feet. The station was established in July, 1912, and experimental work was began in the fall of that year. The experiments reported herein, therefore, have continued three years.

The soil and climate are fairly typical of those of the district lying to the eastward. The results obtained are applicable to southeastern Wyoming and to adjacent small portions of Colorado, Nebraska, and South Dakota.

The soil is a light sandy loam, very productive when sufficient moisture is available. Heavier soils occur to some extent in other parts of the district.

The average annual precipitation at Cheyenne during the past 11 years has been 15.78 inches. The average seasonal precipitation (April to July, inclusive) during the same period has been 8.59 inches.

The evaporation from a free water surface during the growing season (April to July, inclusive) has been about 22.5 inches. The summers are rather short, without excessive heat. Hot winds do not occur. The average frost-free period is 125 days.

Experiments with wheat show that winter-wheat varieties have yielded higher than spring wheats in two years out of the three during which experiments have been conducted. The Ghirka Winter and Kharkof have been the highest yielding varieties.

Rate-of-seeding experiments with the Ghirka Winter and Turkey have given contradictory results during the three years. Four pecks in the acre seems to be the best rate to sow. Early sowing, during the first half of September, has given the highest average yields.

Spring wheats have yielded less than winter wheats. Durum wheat have yielded more than spring common wheats. The Beloturka and Kubanka are the highest yielding durum varieties. Among the spring common wheats, varieties of the Preston group have outyielded Fife and Bluestem wheats.

Experiments on the rate of seeding durum wheat are not conclusive. So far, 2 pecks of the Arnautka variety have given the highest average yields. Sowing early, about the middle of April, has given the highest average yield for spring common wheat.

In experiments with oats the early varietes, Kherson and Sixty-Day, ve given the highest average yields in two of the three years. In 1915, ool wet year, midseason varieties were better. The Swedish Select s given the highest average yield in the 3-year period.

Kherson oats sown at the 6-peck rate yielded better than when sown lower rates. Early seeding, about the middle of April, has given the best ults.

Experiments with spring barley show that the White Smyrna and unchen, both 2-rowed bearded hulled varieties, have given the highest erage yields.

The Svanhals barley sown at the rate of 2 pecks and 3 pecks per acre s yielded more than when sown at higher rates. The same variety has en the best yields when sown rather early, from the middle to the lat- part of April.

Compared with wheat, the yields of spring oats and barley have been ther low. Winter oats and winter barley have been failures.

Variety experiments with flax show Montana Common and Select ssian to be the best varieties. The four leading varieties and their average lds are: Montana Common (C. J. No. 6), 10.1 bu.; Select Russian (N. k. No. 1215, C. I. No. 3), 9.9 bu.; Fargo Common (N. Dak. No. 1133, C. No. 18) 9.8 bu.; and Russian (N. Dak No 155, C. I. No. 19), 9.3 bu. of ins per acre. Sowing at the rate of 15 pounds per acre has given the hest average yield, and sowing about the first of June has proved better an earlier seedings.

Neither winter nor spring emmer has proved of value.

Foxtail and proso millets have given only low yields: foxtail millet m 15.6 to 20.2 bu. of grain and 1613 to 2532 lbs. of straw per acre; proso lets from 5.0 to 13.2 bu. of grain and 603 to 2583 lbs. of straw per acre. ckwheat does not appear promising. Grain sorghums and corn are mising forage crops for roughage or silage, but apparently have little or value as grain crops.

The following varieties of the principal grain crops apparently are t for this district:

Winter wheat. = Ghirka and Kharkof or Turkey.
Spring wheat. = Kubanka, Erivan, Marquis.
Spring oats. = Kherson, Sixty-Day, Swelish Select.
Spring barley. = White Smyrna, Hannchen.
Flax. = Montana Common, Select Russian.

Table II gives: average date of heading and maturity, height, weight bushel, yields and ratio of grain to straw, for: seven varieties of nter wheat, 16 varieties of spring wheat, 8 varieties of oats and 8 rieties of spring barley grown a the Cheyene Experiment Farm for the ears 1913 to 1915. The averages of weight per bushel of winter wheat, ring wheat and oats are only for 2 years.

TABLE II. — *Average Results obtained at Archer from Heading to Harvest.*

Group and Variety	C. I. No.	Date of heading	Date of maturity	Height inches	Weight per bushel Pounds	Yield per acre: Grain Bushels	Yield per acre: Straw Pounds	Ratio grain to straw
WINTER WHEAT.								
Ghirka:								
Ghirka winter	1 438	June 29	July 28	27	61	18.2	2 018	1 : 1.85
Crimean:								
Kharkof	1 442	June 29	July 26	28	58	17.2	2 170	1 : 2.10
Crimean	1 559	» 29	» 26	28	60	17.2	1 847	1 : 1.79
Crimean	1 432	July 2	» 30	26	60.5	16.8	2 463	1 : 2.44
Turkey	1 571	June 29	» 26	28	60	16.6	2 040	1 : 2.05
Malakoff	2 908	July 2 (*a*)	» 31 (*a*)	30 (*a*)	62	16.0	1 769	1 : 1.84
Crimean	1 437	June 29	» 27	27	58.5	15.6	1 804	1 : 1.93
SPRING WHEAT.								
Durum:								
Beloturka	1 520	July 13	August 18	28	62.0	16.2	1 215	1 : 1.25
Kubanka	1 516	*id.*	» 17	27	61.5	15.9	1 222	1 : 1.28
Pererodka	1 350	*id.*	» 18	29	62.0	15.6	1 395	1 : 1.49
Kubanka	1 440	*id.*	» 18	27	61.7	15.2	1 197	1 : 1.31
Preston:								
Brivan	2 397	July 15	August 15	21	58.0	13.6	1 188	1 : 1.46
Red Russian	4 141	» 16	» 16	24	58.0	12.5	1 273	1 : 1.70
Spring Turkey	4 154	» 17	» 17	25	60.0	12.2	1 240	1 : 1.69
Unclassified:								
Galgalos	2 398	July 15	August 16	22	50.2	13.1	983	1 : 1.25
Defiance	3 703	» 18	» 18	25	51.2	8.8	1 063	1 : 2.01

Glyndon (Minnesota No. 163)	2 873	» 18	» 19	23	55.7	9.3	1 221	1 : 2.19
Bluestem:								
Haynes (Minnesota No. 169)	2 874	July 18	August 19	24	51.0	8.4	1 095	1 : 2.17
Marvel	3 082	» 21	» 21	25	53.5	7.9	1 147	1 : 2.73
OATS.								
Early:								
Sixty-Day	165	July 7	August 1	23	34.5	23.7	805	1 : 1.06
Kherson	459	» 7	July 31	24	33.5	23.1	715	1 : 0.97
Midseason:								
Swedish Select	134	July 20	August 13	28	36.5	29.6	1 230	1 : 1.30
Colorado No. 37	619	» 21	» 14	25	37.7	27.8	1 120	1 : 1.26
Ligowo	492	» 21	» 14	28	39.5	27.6	1 233	1 : 1.40
Silvermine	714	» 20	» 12	28	37.2	27.0	1 063	1 : 1.23
Abundance	731	» 21	» 16	28	37.0	26.7	1 065	1 : 1.25
Late:								
Black Tartarian	768	July 21	August 14	26	38.2	22.5	967	1 : 1.34
BARLEY.								
Two-rowed hulled:								
White Smyrna (Ouchac)	658	July 12	August 1	18	47.5	21.5	987	1 : 0.96
Hannchen	531	» 14	» 9	19	49.7	19.9	1 002	1 : 1.05
Hanna	24	» 22	» 8	19	48.7	17.2	1 163	1 : 1.41
Six-rowed hulled:								
Coast	690	July 8	August 2	21	40.0	20.7	1 052	1 : 1.01
Manchuria (Minnesota No. 6)	638	» 12	» 3	22	40.7	17.3	1 047	1 : 1.26
Horsford	877	» 9	» 2	24	38.7	15.8	948	1 : 1.25
Manchuria (Minnesota No. 105)	354	» 10	» 3	21	40.5	15.7	1 095	1 : 1.45
Six-rowed naked:								
Black Hull-less	1 106	July 14	August 8	19	61.2	14.9	1 012	1 : 1.13

(a) Average for 2 years only.

329 – **Manuring of Maize on the Government Experiment Farm, Gwebi, Rhodesia.** – HOLBOROW, A. G., in *The Rhodesia Agricultural Journal*, Vol. XIII, No. 4, pp. 506-511. Salisbury, Rhodesia, August 1916.

The manurial experiments carried out at the Gwebi Government Experiment Farm, in 1915-1916, for the purpose of determining the residual value of fertilisers, showed that the same land which received the

TABLE I. — *Results Obtained with the 7 Manurial Dressins.*

Manurial dressing per acre	Effect of fertilisers in 1915, first season after application		Effect of fertilisers in 1916, second season after application		Combined yields obtained in season 1915 and 1916 and increase resulting from application of fertiliser		Value of two years increase at £/- per bag of 200 lbs. on farm	Cost of fertiliser dressing per acre £
	Total yield of grain per acre lbs.	Increase due to manuring per acre lbs.	Total yield of grain per acre lbs.	Increase due to manuring per acre lbs.	Combined yield of grain in two seasons per acre lbs.	Total increase in two season due two manuring In season 1914-15 per acre lbs.		
Plot 1. No. Manure	2 061*	—	1 291*	—	3 352	—	—	—
Plot 2 (35 lbs. Nitrate of Soda. 65 lbs. Double Superphosphate. 25 lbs. Sulphate of Potash.)	3 293	1 232	2 097	806	5 390	2 038	81/6	20/
Plot 3 (50 lbs. Nitrate of Soda. 75 lbs. Double Superphosphate. 40 lbs. Sulphate of Potash.)	3 108	1 047	1 831	540	4 939	1 587	63/5	28/
Plot 4 (70 lbs. Nitrate of Soda. 130 lbs. Double Superphosphate. 50 lbs. Sulphate of Potash.)	3 320	1 259	2 008	717	5 328	1 976	79/	40/

* Average of 3 check plots.

† Pre-war Prices.

ssing the previous year, was capable (without any further manuring) still producing large increases in the yield of maize. The results were o corroborative of the experiments in the years 1913 and 1914. Table I es a summary of the results obtained with the 7 fertilisers used in the periment.

The land chosen for the experiment at Gwebi was of a red diorite for- tion of average fertility. The trials were carried out with selected seed ize (Salisbury White Variety). This was planted each season on Decem- r 8th upon land which was ploughed, rolled, and harrowed immediately er sowing, and cultivated with the Hallick weeder and horse-hoed ice during the season. Table II gives the rainfall returns for the 2 years the experiment.

	1914-15 inches	1915-16 inches
September	0.36	0.29
October	—	0.19
November	2.14	1.62
December	11.30	2.26
January	7.09	12.04
February	7.58	0.71
March	2.55	3.59
April	0.62	1.56
May	0.08	0.16
	31.81	22.42

Table III gives the percentage of cobs over 6 inches in length obtained in the different experiments in 1915 and 1916.

TABLE III. — *Percentage of Cobs Over 6 Inches in Length*

Manurial Dressing	1913	1916
Check plot without Fertiliser	51 %	26 %
I	70	45
II	66	46
III	68	38
IV	72	51
V	78	52
VI	74	44
VII[a]	78	47
VII[b]	75	43
VII[c]	78	56

10 - **P 7 and P 6: Two Notable New Varieties of Rice Grown in Italy.** — MARCARELLI, B., in *Il Giornale di Risicultura*, Year VII, Nos. 1-2, pp. 4-10, 2 figs. Vercelli, January 15-30 1917.

The variety of rice, " Chinese originario ", is now very widely cultivated in Lombardy and Piedmont, and is almost completely acclimatised. From this variety the brothers SANCIO, at Casonvecchio (Santhia, Province

of Novara), have obtained many types, which have been generally tivated for many years and are remarkable by virtue of their producti and their precocity. Each year the brothers SANCIO isolate a large n ber of pure strains which have been previously tested for strength and ductivity. This is done by sowing the seeds of each panicle in sepa rows, and the most promising strains are finally multiplied and tested der extensive cultivation conditions. By these methods two new va ties have been selected since 1915 — P7 and P6 — both of which sho marked progress in the production of rice with a high yield and supe commercial qualities. They have already passed the experimental st and have definitely entered the field of practical agriculture.

These two varieties were cultivated at the Rice-Growing Statio Vercelli during the seasons 1915 and 1916. The appended table gi the results of these experiments and those of the laboratory tests.

Results of observations on the culms, panicles and grains of the type P7 and P6 (average of 2 to 4 observations).

	"Chinese originario"	"Originario P 7"	"Originario P 6"
Length of plants	90-110 cm.	100-130 cm.	80-100 cm.
Length of panicle	18- 21 cm.	19- 23 cm.	18- 20 cm.
Number of spikelets per panicle	9- 12	10- 14	9- 11
Number of grains per panicle	130-150	150-180	120-140
Number of grains per litre	21 932	16 482	18 851
Weight of 1 000 grains	30.750 gr.	36.530 gr.	35.010 gr.
Weight of 1 litre of paddy	675 gr.	600 gr.	660 gr.
Measurements of raw grains:			
Length	7.30 mm.	8.25 mm. (1)	8.67 mm.
Frontal-posterior diameter	3.55 mm.	3.78 mm.	3.65 mm.
Lateral diameter	2.32 mm.	2.50 mm.	2.48 mm.
Yield in weight at polishing:			
Commercial variety	68 %	71 %	70 %
Offal	2.5 %	2 %	2 %
Period of Ripening	20 Sept.	15 Sept.	20 Sept.
Yield of paddy per hectare	52 quintals	51 quintals	54 quintals

(1) This measurement does not include the awns.

The following are the chief morphological and agricultural characteristics of the two varieties: —

"ORIGINARIO P7": — A straight plant, whose herbaceous part well developed, fairly resistant to lodging. Length of culm from 1 to metres, very thick, of a compact and strong formation. Blades of le very much developed, dark green; nodes of culms very marked, rat darker than the other green parts; tillering limited, but not inferior that of "Originari Precoci".

The panicle is thin, with a very elongated rachis (19-23 cm.), nu ous spikelets (10 to 14) and a good number of grains (150 to 180) w

rely fall, of a fine straw colour, with strong villous glumes, and well-arked veins, covered with stiff hairs and rudimentary awns.

The chief characteristic of this species is the size of the grains, whose easurements are: — average length, 8.25 mm. — frontal-posterior dia-eter, 3.78 mm. — lateral diameter, 2.5 mm. — weight of 1,000 seeds, 53 gr., which is much above the weight hitherto attained by the best rieties of native, large-grained rice. Its yield at polishing is also much eater than that of other types.

The period of maturity (September 15th) is a few days in advance of at of "Chinese originario", and the yield in paddy varies between 40 d 41 1/2 cwts. per acre. Owing to the length of the stalk and the abund-t development of the leaves there is a high yield of straw.

This type does well even in moderately fertile soils because the strong velopment of all the aerial parts which takes place immediately the plant rts growing, and the abundance of the radical system, assure a marked wer of absorption which is in every way proportionate to the require-nts of the plant.

"ORIGINARIO P6": — A much less vigorous plant than the preced-one, but strongly resistant to lodging. The culm does not exceed cm. in length and is relatively thin; leaves moderately developed, light en in colour and less abundant than in P7; nodes of the culm only slight-marked and whitish in colour; tillering power equal to that of "Chinese ginario".

The panicle is full, arched with a rachis of medium length (18 to 20), with a moderate number of spikelets (9 to 11) and grains (120 to 140); y are more fertile than those of P7 (i. e. there are fewer empty glumes), not fall, are of a pale straw colour with glumes slightly thinner than se of P7, and completely smooth and beardless.

The grains of this variety are longer and give the following measure-nts: — average length, 8.67 mm. — frontal-posterior diameter, 3.65 . — lateral diameter 2.48 mm. — weight of 1 000 seeds, 35.01 gr. Its ld at polishing is slightly less than that of P7, but, from a commercial nt of view, the polished seeds are of a superior quality, rather resembl-the grains of the varieties "Ostiglia", "Ranghino", "Nero di Via-", etc.

The period of maturity (September 20th) coincides with that of "Chin-originario", and the yield in paddy is slightly superior both to this variety and to P7, for it varies between 43 to 43 3/4 cwts per acre. This variety is a little difficult to cultivate, but adapts itself equally to compact clay soils and to moderately loose soils, so long as they are y fertile and irrigated with warm water.

Morphology and Conditions of Growth of Transplanted Rice in Piedmont, Italy.

FARCARELLI, B., in *Il Giornale di Risicoltura*, Year VI, No. 13-14, pp. 211-222; No. 22, pp. 341-347; No. 23, pp. 357-364; No. 24, pp. 372-378, fig. 1-20. Vercelli, 1916.

In order to demonstrate the specific causes which lead to a greater luction by transplanted rice as compared to rice cultivated by the or-

dinary methods, the author studied the variations caused by transplanting to the radical system, the tillering and earing of this cereal. The variety *Chinese originario*, which is largely cultivated in the Vercelli district, was chosen for the experiments because of its high yield and adaptability to transplantation.

Even if carried out in soil under water, transplanting is followed in a few hours by a distinct withering of the extremities of the rootlets, after which these is a marked change in the whole plant, including the aerial part. However favourable the soil conditions may be, and however carefully it is effected, the pulling up of the plant destroys a large number of the fine roots which bear absorbant hairs. Immediately, however, the plant reacts by emitting abundant new roots round the neck and first nodes. If a rice seedling is dug up carefully 3 or 4 days after transplanting strong, adventitious organs may be seen which, while fixing the plant in the soil, are able also to replace directly the lost rootlets by means of the cells of their piliferous layer.

Results of Experiments.

Method of rice cultivation	Experiment	Number of culms per plant	Number of culms per sq. metre	Length of plants	Length of panicles	Number of spikelets per panicle	Number of grains per panicle	Yield of grains per sq. metre	Yield of straw per sq. metre	Weight of 1000 grains	Yield at polishin in percen of weight	
											Commercial product	Waste
								gr.	gr.	gr.		
Non-transplanted	A	1—3	306	80— 85 cm	15—19 cm	6—10	84—149	605	560	30.065	70.80	29.20
	B	1—2.5	263	75— 80	15—20	6—10	78—134	584	502	29.915		
Transplanted	A_1	2—4.5	312	95—100	18—23	7—11	106—189	816	786	30.325	71.30	28.70
	B_1	3—6	278	100—110	18—25	7—13	115—247	852	748	30.760		

The adventitious roots form along the plane of insertion of the le sheath and mostly appear on the nodes of the lower part of the culm whi remains under water. Once emitted, the rootlets remain a long time wit out developing, but, as soon as the nutritive requirements of the plan demand an extension of the absorbant area of the roots, they develop wi great rapidity. Transplanting, then, causes a very sensible reduction true roots, but gives rise to a simultaneous and abundant formation adventitious roots, which fulfill all the functions of the lost ones. T maximum utilisation of fertilising elements is hereby assured, becau of the greater expanse of the new roots and because of their tendency remain in the more fertile superficial layers of the soil, where the best ph sical-mechanical conditions prevail. From this it may be seen that tra planted rice develops more completely and gives a more abundant yie than rice which has not been moved.

The biological characteristics peculiar to transplanted rice with

ird to its herbaceous growth, earing and ripening are still more interesting
ian the modifications of its root system. As soon as the plant has taken
ot new shoots form at the base of the culm, which, with the increase
leaf surface, assure an abundant and simultaneous stooling. If the
nsecutive phases of the growth of the culms are observed, a certain
ause may be noticed in the principal stem, which, although at first higher
ian the others, is soon overtaken by secondary culms which, owing to the
cial conditions of space, air and light, expand and form wide leaves of
intensive green with long, strong internodes and well-defined nodes.
ere is very little difference in the date of maturity of the primary and
ondary culms, and the successive and very backward earings, which
e such a marked feature of the customary methods of cultivation, are
us avoided.

The paddys of transplanted plants give a larger yield of polished rice
an those of rice fields where the plants are not moved. The grains,
erefore, have a high commercial value, and their external characteristics,
creased weight, and greater yield of polished rice, give them an obvious
periority on the market.

2 - **The Cultivation of Potatoes from Potato Skin; Experiments Carried out in Italy.** — CASTALDI, G., in *Società degli Agricoltori italiani, Bollettino quindicinale*, Year XXII, No. 3, pp. 44-46. Rome, February 15, 1917.

In the spring of 1916, at S. Angelo of Alifa (Province of Caserta), the
uthor carried out experiments on the cultivation of potatoes by cutting
ie skin into strips about 2 mm thick (that is to say, with some of the
esh still adhering to it), with the eyes. From 100 parts by weight of
otatoes be obtained 45.5 parts of skin for planting and 54.5 parts which
ould be used for food or trade purposes. The experiments were carried
ut on square plots, all of which had been similarly treated as regards the
reparation of the soil and manuring.

On the 19th. March alternate plots were planted with whole potatoes
nd skins of the same variety respectively. Identical methods of culti-
ation were carried out at the same time on all the plots. The harvest
as gathered on the 4th. August. The vegetation of the different plots
as uniform and there was no great difference in the yields. The average
ields were as follows:

	Yield from whole potatoes	Yield from skin in strips
Area of each plot	43 sq. yards.	43 sq. yards.
Quantity of material used for planting	120 lbs.	55 lbs.
Potatoes harvested	633 lbs.	619 lbs.

In terms of weight per acre these results show that 5 ½ cwts. of skin
elded 63 ½ cwts. of potatoes, whereas 12 cwts. of whole potatoes yield-
. 63 ¾ cwts.

333 - ***Medicago falcata* in the South of Italy.** — LOPRIORE, G. in *Le Stazioni Sperimentali Italiane*, Vol. XLIX, No. 12, pp. 549-558, 3 fig., Modena, 1916.

The yellow-flowered *Medicago falcata* grows wild in Southern Italy where it even invades cultivated land, causing much damage. It is distinguished by its great resistance to drought, owing to its tap-root which in suitable soil, penetrates to a depth of many yards.

At Cerignola (Apulia) attempts are being made to select and transplant the straightest plants and those which show the most vigorous development. Apart from the botanical characteristic of its fruit, which is sickle shaped instead of being spiral as in *M. sativa*, the culm of *M. falcata* is not perfectly straight, but is more or less curved, and even creeps along the ground. Its leaves are narrower and smaller than those of *M. sativa* and it does not give so large a yield of fodder.

The analysis of a sample in full flower taken from Cerignola on the 19th. June, 1912 gave the following results:

Hygroscopic moisture	7.36 %
Crude protein	14.00
Crude fat	2.33
Cellulose	34.60
Ash	8.10
N. free extract	33.61
	100.00

As may be seen, the plant is rich in nutritive matter. The quantity of protein (14-16 %) is equal to the maximum found in the grasses of Southern Italy; the amount of ash and fat is sufficient, though a little below that of normal fodders.

These data only concern a wild product, which has not been cultivated in any way whatever. It may be assumed that, if the plant were cultivated, its value would be greatly increased.

334 - **Comparative Studies on Different Varieties of Hevea Rubber in the Amazon District, Brazil.** — HEIM, F., in *Bulletin de l'Office Colonial*, Year IX, No. 105, pp. 501-516. Melun, December, 1916.

The author studied 6 samples of rubber of the "Corracha fina" variety from different parts of the Amazon district in order to see if suitable plantations could be made from seed obtained from certain local varieties of Amazon Hevea.

There was little difference between the samples examined. They were all prepared by the same method, fumigation, and were obtained in the form of small balls covered with a membrane. Commercially they are classed as follows: No. 1, "Fina das Ihlas" — No. 2, "Fina de Caviana" — No. 3, "Fina de Amapu" — No. 4, "Fina de Cajary" — No. 5, "Fina de Xingu" — No. 6, "Fina de Tapajoz".

The results of the analyses given include, for the chemical composition — ash — moisture — water soluble matter — resins — matter insoluble in chloroform — protein — rubber — and, for the commercial analysis

xibility — extensibility — tenacity — strength — elasticity — differential index.

It must be remembered that none of the samples were less than a year d, and had, therefore, already undergone some change which, although appreciable in the organic examination, could be recognised by certain ecial indications. A fairly large proportion was insoluble in chloroform, hich lead to the supposition that part of the rubber had polymerised. ll the samples examined had rather low elastic properties ; this appeared be in relation to the alteration undergone by the rubber.

The comparative values of the varieties studied when fresh must be nsidered as superior to those of the samples examined. All the samples ad a high tenacity and extensibility value. The results of a comparison etween the qualities of current commercial varieties and the samples studd show that the latter should be placed in the fine medium soft Para lass. As may be seen from the following table the differential index particular leads to this conclusion :

	Flexibility	Extensibility	Tenacity	Stength	Elasticity	Differential index
	—	—	—	—	—	—
Fine Para (hard cure)	1	1	1	1	1	1
Fine Para (soft cure)	1	1	1	0.9	1	1
Fine soft Para	1.1	1.5	1.2	0.9	1.1	0.9
Average of fine Para examined	1.5	1.8	1.3	0.7	0.8	0.6
Fine medium soft Para	1.5	1.8	1.0	0.6	1.0	0.6

From the results obtained the author concludes that the differential operties of the Hevea rubber trees indigenous to the various Brazilian stricts are not sufficiently marked to justify preference being given to the ed from one particular district in the formation of new plantations.

- **Fruitgrowing in New Zealand.** — LONGTON, J., in *The Fruit World*, Vol. XVII, No. 12, pp. 354. Melbourne, December 1916.

Until 1909 the fruitgrowing industry in New Zealand progressed very sly. During 1909 a considerable forward movement was made in nting out areas in several districts of New Zealand, and this movement increased until plantings now average about 3 600 acres a year. The a planted at the present time is approximately 49 000 acres. The bulk planting is just coming into profit and so far the highest export for season has been only 67 964 cases, but, with the new orchards which coming into bearing, and the increased production every year, it is pected within the next two or three years to have a couple of million shels for export.

Most of the recent plantations contained apples principally of the ext variety. Fruitgrowing was not confined to one district. Nelson had largest area, but Central Otago, Hawke's Bay and Auckland were nching out extensively.

It is anticipated this year that there will be a surplus of 250 000 cases fruit available. The Government passed a Bill last year, by which a

tax of 1 per acre is now being collected by the Government from fruit growers and handed over to the New Zealand Fruitgrowers' Federation Ltd. which is representative of all the fruitgrowing Associations in New Zealand. It is estimated that the tax will produce to commence with some £3 000. It is only by affiliation to the Federation as a member of an Association that any fruitgrower can derive any benefit from this tax. Three cooperative packing and selling companies are at present in existence and a start has been made with the erection of cool stores in which the Government of New Zealand has advanced the necessary capital.

It has been decided by the federation to inaugurate an advertising campaign to increase fruit consumption in New Zealand, considering that in New Zealand itself there were possibilities for a most profitable market. Regarding export, it was proposed to send a representative to investigate the markets of the eastern States of America and probably India and the Straits Settlements. The cost of this was to be borne by the tax money raised by the Government.

336 - **Hybrid Direct Bearers in the Côtes-du-Rhône Region, France, in 1916.** - DU MOULIN A. and VILLARD V., in *Le Progrès agricole et viticole*, Year 34, No. 2, pp. 36-4 No. 3, pp. 59-62. Montpellier, January 14 and 21, 1917.

Results of the 17th year of observations on hybrid direct bearers (1 In 1916, the observations were on the following:

I. — VARIETIES ALREADY SUFFICIENTLY KNOWN.

A. — Black Hybrid Direct Bearers:

1) 1st *period*: C. 166-46 — C. 202-75 — S. 128 — S. 1000 — S. 2859 — S. 4613.

2) 2nd *period*: Seibel 1 — S. 2007 — S. 2660 — Berthille-Seyve 618.

3) *End of* 2nd *and* 3rd *period*: C. 7120 — C. 132-11.

B. — White Hybrid Direct Bearers:

1) 1st *period*: C. 272-60 — S. 880 — S. 4681 — Berthille-Seyve 450 — Gaillard 1

2) 3rd *period*: S. 793 — Castel 13 706.

II. — VARIETIES OBTAINED MORE RECENTLY.

A. — Black Hybrid Direct Bearers:

1) 1st *period*: B. S. 1129 — S. 4589 — S. 4629 — C. 162-97 — Malègue 829-6 — S. 51 — S. 5153.

2) *End of* 2nd *and* 3rd *period*: B. S. 822 — S. 4271.

B. — White Hybrid Direct Bearers:

1) 1st *period*: S. 4638 — S. 4986 — S. 4995 — C. 299-35.

2) 2nd *period*: S. 4633 — S. 5061 — S. 4762.

Finally the authors give the following list of hybrids, according the period when the buds open (observed April 22, 1916).

I. — VARIETIES WITH LATE-OPENING BUDS
(which on April 22, had buds of 0.5 to 1.5 cm long).

Petit Bouschet — B. S. 822, 877, 1125, 1134, 1138 — Caille 16 — Castel 19 422 — Co 151, 156, 503, 106-38, 142-86, 162-5, 162-46, 162-97 — Malègue 469-9, 474-5, 1132-26, 11

(Ed.)

(1) See *B.* 1916 No. 762.

57-14, 1397-36, 1583-21, 1595-5, 2149-7, 2324-1 — Perbos N. 1-46, — Seibel 1-63, 138, 3, 844, 858, 880, 1077, 2633, 2658, 2660, 2666, 2709, 3021, 4153, 4243, 4271, 4459, 4473, 99, 4587, 4589, 4591, 4603, 4629, 4646, 4662, 4667, 4673, 4681, 4685, 4689, 4696, 4703, 11, 4716, 4730, 4738, 4737, 4738, 4748, 4762, 4782, 4842, 4852, 4876, 4877, 4954, 4955, 70, 4986, 4989, 5001, 5061, 5079, 5125, 5145, 5154, 5161, 5178, 5179, 5187, 5191, 5192, 98, 5204, 5205, 5221, 5243, 5298, 5308, 5312, 5320, 5322, 5329, 5354.

II. — VARIETIES WITH MEDIUM-OPENING BUDS
(*which on April 22, had buds of 2 to 3 cm. long*).

Baco 1, Maurice Baco — B. S. 450, 872, 1129, 1612, 1886, — Castel 129, 227, 1028, 13706 Couderc 363 N, 6334, 7120, 28-112, 132-11, 171-56, 202-75, 286-68, 299-35, 337-50 — illard 157 — Malègue 71-7, 1055-5, 1647-8, 1897-12, 2045-81 — Péage 5-17 — Perbos N 6-53, Seibel 73, 82, 128, 2052, 2686, 2821, 4111, 4132, 4595, 4596, 4614, 4615, 4616, 4628, 32, 4633, 4638, 4648, 4669, 4677, 4684, 4701, 4707, 4709, 4720, 4725, 4749, 4767, 4768, 25, 4833, 4871, 4910, 4945, 4953, 4976, 4979, 4990, 4994, 4995, 5024, 5033, 5068, 5077, 90, 5091, 5138, 5163, 5164, 5167, 5175, 5181, 5184, 5207, 5212, 5213, 5230, 5279.

III. — VARIETIES WITH MIDDLE EARLY-OPENING BUDS
(*which on April 22, had buds of 4 to 5 cm. long*).

Capéran — B. S. 618 — Buisson vert — Castel 6011 — Couderc Baronne 4, 106-46, 106-51, 6-58, 272-60 — Jurie 102 — Malègue 829-6 — Seibel 1002, 2006, 2806, 2859, 4151, 4461, 36, 4643, 4645, 4656, 4657, 4683, 4773, 4968, 4991, 4999, 5170, 5233, 5259, 5409.

IV. — VARIETIES WITH EARLY OR VERY EARLY-OPENING BUDS
(*which on April 22, had buds over 5 cm. long*).

Couderc 235-120 — Péage 5-10, 1-4 — Seibel 867, 2007, 4644, 4963, 4964, 4969, 5140.

7 - **Resin-Tapping from Spruce, Scotch Pine and Black Pine in the Forests of Austria** (1); **Results obtained in the Year 1916.** — FRIEDRICH, ERNST, *in Oesterreichische Forst- und Jagdzeitung*, Year 25, No. 6, pp. 31-33. Vienna, February 9, 1917.

In order to obtain within the country the crude resin necessary to mmerce and to the army, the Imperial and Royal Board of Forests and tates of Vienna, in 1916, ordered the collection of resin from spruce trees ich had been injured by cutting or mountain game, and from stumps, etc. ; this method 1,700 quintals were obtained. The collection was made by holl children, women, etc., and the result and expense varied greatly cording to locality. The result aimed at was far less a monetary one an the increase of resin production, namely : — 1) Resin tapping from l plantations of spruce to be felled in the following years 2) Resin tapping m Scotch pine by the KIENITZ method ; 3) Introduction of the French ethod of tapping and collecting in receivers in plantations of black pines inus *austriaca*).

SPRUCE. — Owing to shortage of labour it was at first only possible to tap l plantations in the 3 forest departments of the Erzgebirge. The trees be felled in 1916 were only tapped at the foot in order to protect the rk, whereas the trees for felling in the years 1917 and 1918 were tapped the height of a man. The resin was collected in the autumn and gave

(1) On the subject of resin-tapping in Austria, see also B. 1915, No. 62. (*Ed.*).

an average yield of 0.05 kg. per cubic metre instead of 0.2 kg. as had been expected. Forty five thousand trees gave a yield of 22.5 quintals. The tapping was paid by the day, the gathering of the resin by the amount collected. The cost price, including packing and carriage to the station was 4 821.34 *Kronen* (2) or 2.14 *Kronen* per kg. As the 22.5 quintals brought in 2.25 *Kronen*, there was a deficit of 2 293.5 *Kronen*, equal to an average of 1.01 *Krone* per kg.

According to the author the low yield was due to the cold and rainy weather of the summer of 1916 which hindered the flow, and also to the fact that the resin was collected 6 months after tapping. The unfavourable financial results may be attributed chiefly to the high salaries paid. As it will not be necessary to make new incisions better results may be obtained during the coming years, and a slight profit may be expected in 1917 even if the yield be only 0.1 kg. of resin per tree.

SCOTCH PINE. — The tapping was carried out by the KIENITZ method on 4 073 trees, at the height of a man. Three incisions of an average diameter of 28 cm., were made in each tree. The tapping was begun on the 18th June and continued till the 15th. November. The liquid resin was collected from the 18th. June till the 14th. October, and the scrap resin from the 14th. October to the 15th. November from 2 370 trees only.

A weight of 1 425 kg. of liquid resin and 208 kg. of scrap resin was obtained. Estimating the value of the former at 150 *Kronen* per quintal and the latter at 110 *Kronen* the total of 1 633 kg. obtained represented a value of 2 366.3 *Kronen*. The cost price was placed at 3 094 *Kronen* there was, therefore, a deficit of 727.7 *Kronen*.

The unsatisfactory financial result is attributed to the late date on which the harvest was begun, the bad atmospheric conditions, the high salaries, and heavy transport expenses, and largely also to the want of experience of the workers. In this case also better results are expected next year.

BLACK PINE. — The resin tapping was carried out by the French method over an area of 89.2 hectares, with an average density of 770 feet per hectare, calculated to contain a total of 13 500 feet. The estimate was drawn up as follows :

PROFIT ON RAW MATERIAL.	Kronen		
10 800 kg. of scrap-resin at 65 *kronen* per quintal	7 020.00		
43 200 kg. of liquid resin at 105 *kronen* per quintal	45 360.00		
		52 380.00	*kronen*
EXPENDITURE.			
Harvest	22 080.00		
Transport to station	1 620.00		
Implements for tapping (carried to account in the first year)	6 448.10		
Sundries	2 000.00		
		32 148.10	*kronen*
Net profits		20 231.90	*kronen*

(2) 1 Krone = 10 *d.* at par.

It was soon seen that the results obtained would be below the estimate r various reasons; 1) it was not possible to find the necessary labour; the cups could not be obtained in time, and, as they had a capacity of 5 litre instead of 1 litre, a notable increase in labour resulted; 3) the ages were higher than had been estimated; 4) tapping could only be be- in on the 17th. July and could only be carried out on 6 000 trees instead on the 13 500 which had been estimated for.

As the best time for the flow of the resin had been allowed to pass, the eld was very low, reaching a total of 5 028 kg., of which 4 377 kg. (87 %) ere collected in cups and 651 kg. (13 %) were scraped. An average of 83 kg. per tree was thus obtained. Experimental trees, tapped from the e 1st. May to the 25th. October regularly every 3 or 4 days according to e atmospheric conditions gave an average of 4.45 kg. of resin each. The nancial result of this method was very bad, and in no wise corresponded) that of the estimate.

In spite of the relative failure of these experiments the author pro- oses that they should be continued and new methods tried.

38 - **Protection Forests and Their Influence on the Rainfall and Watercourses in British India.** — See No. 304 of this *Bulletin*.

39 - **Afforestation of Dunes in the Province of Cadiz, Spain.** — See No. 304 of this *Bulletin*.

LIVE STOCK AND BREEDING.

- **The Possible Formation of Specific Antibodies in the Blood of Horses as a Result of Ingestion of dead Bacilli.** — LANGE W. in *Deutsche Tierärztliche Wochenschrift*, Year 24, No. 45, pp. 497-498, Hanover, Nov. 4, 1916.

In order to ascertain whether ingestion of dead glanders bacilli provoked e formation of specific antibodies, a horse was fed daily with its drinking ter $1/_2$ litre of cultures of bacteria belonging to 5 different strains. The cul- res consisted of well developed 2 day-old bacilli which were killed by ating for 2 hours at 60° C. The whole dose was invariably well accepted the animal. For 4 weeks, during and after the experiment the blood is examined at intervals of a few days by the agglutination method and e method of complement fixation. Further, in several cases the eyes of e horse were also examined.

Results: Throughout the whole course of the experiment there was no crease in the agglutination values; the complement fixation method invar- bly gave negative results; similarly examination of the eyes. It follows erefore that ingestion of strong doses of dead glanders bacilli did not result the formation of observable specific antibodies.

341 – **Injury to Grazing Cattle caused by the Sand-fly *Simulium reptans*.** – MATTHIESEN and BEUTLER, in *Berliner Tierarztliche Wochenschrift*, 32nd Year, No. 32 pp. 373-377. Berlin, August 10, 1916.

The sand-fly *Simulium reptans*, common in the shallow water of the rivers Leine and Aller (Prussia) has again (1), in 1916, caused a number of losses among cattle at grass. The temperature of the water, which was relatively low up to the 20th. April, rose in gradual fashion, thus favouring the appearance of large numbers of these flies which subsequently attacked the cattle and even horses.

On April 23rd. the writers visited Neustadt in order to study the disease occasioned by these pests. A large number of sick and dead animals were examined, and in many cases the location of the infected pastures and the time of appearance of the parasite were also observed. The nymphs of *Simulium* were found in running water, even in fields which hitherto had remained exempt.

Careful examination of the wounds in the skin of dead animals shows a central dark spot, corresponding to the channel produced by the piercing mouth parts. The cardiac muscle, finely teased out under the microscope, shows capillaries gorged with blood and very distinct transverse markings. Bacteriological examination of blood from the heart, the lymphatic glands and portions of the spleen, generally gave negative results. Only a few rod-shaped bacteria resembling *B. coli* were found and these probably obtained access of the body after the death of the animals. Mice inoculated with the material examined remained unaffected..

The symptoms of the disease are often very quick in appearing, sometimes only a few hours after the animal has been bitten ; the time required probably depends upon the amount of poison introduced. Death may occur or a cure be effected at widely differing intervals of time, sometimes only a few days after the bite.

Among horned cattle the spots preferred by the sand-fly for biting (teats, scrotum, flanks, lower portion of the thighs) were never swollen, but the corresponding lymphatic glands were fairly often so. The swellings beneath the throat and at the neck are a result of the weakened action of the heart induced by poisoning. The brain is affected in more or less the same way. When lying down the sick animals often adopt positions similar to those adopted by cows suffering from milk-fever. This is probably due to the insufficient supply of blood to the brain. The beasts eat and digested with difficulty, the peristaltic action being weakened ; however, there was no case of fever ; $^2/_3$ of these animals succumbed.

It is probable that animals fairly long at pasture are less susceptible to bites.

The instructions hitherto given in spring by the police with regard to the keeping under observation of cattle in districts threatened by *Simulium* and with reference to their stabling immediately after the appearance of the pests in large numbers, were not sufficient to prevent, in 1916, big losses

(1) See B. 1915, No. 1173. (*Ed.*).

f stock. On the other hand, good results were oftained from a police or-er issued at the end of April restricting the pasturing of live-stock in the hreatened areas, before May 15, to cold and rainy days, and to the night ime (10 p. m. to 5 a. m.) when the weather was fine. Equally good results ere given by the official circular distributed before the expiration of the bove order which recommended breeders, as a precautionary measure, not o put their stock to grass on hot days for a further period of time after lay 15.

For 1917, the writers recommend the same arrangement except that he period during which pasturing is prohibited during the day-time should e extended to cover the period April 1 — June 1.

42 - **Contribution to the Knowledge of the Strongylid *Syngamus bronchialis* in Domestic Poultry.** — FEURBISSEN, W., in *Zeitschrift für Fleisch- und Milch hygiene*, Year 27, Nº. 2, pp. 17-22. Berlin, Oct. 15, 1916.

Although a great deal has been published on the subject of the Strongylid *Syngamus trachealis*, frequently occurring in the larynx and trachea of lomestic poultry, very little is yet known about the closely related species *Syngamus bronchialis*. MÜHLIG was the first to describe it accurately, but ince that time very little work has been done upon it.

The present writer studied a dead gosling from a flock of 25 of these irds which had all gone sick after having been several times in a muddy ond. A large number succumbed after showing symptoms of asthma, oss of appetite and weakness.

Upon dissection, 72 Strongylids were found in the trachea and bronchi. The trachea contained 11 reddish worms of fairly large size, while the bronchi ontained numerous Nematodes of similar appearance but of a whitish olour, which had obtained access even to the finest bronchi. The former were fastened by the head to the mucous membrane of the trachea, but were easily detached. The majority of those in the bronchi, however, were free. About 1/3 of these parasites were in the act of copulation, the latter less intimate than in *S. trachealis*. The writer's observations confirm the exact zoological description of MÜHLIG, except that the former has seen rather larger worms.

In another gosling examined the trachea and lungs were free from Strongylids. In this connection, however, it is opportune to remark that at the time of dissection the body was completely decomposed and infested by the maggots of flies.

The right portion of the abdominal air sac was inflated with a caseous exudate containing numerous fragments and eggs of strongylids. The case was evidently one where the animal had succumbed as an eventual result of the exhaustion produced by the disease. Evidently, the Strongylids obtain access to the air cells, a fact which should be taken into account in performing a post-mortem.

As in the case of *S. trachealis*, the life cycle of *S. bronchialis* is not yet known, which makes it impossible to control the disease caused by this parasite.

343 — **The Iodine Content of Food Materials.** — BOHN, RALPH M. (Laboratory of Agricultural Chemistry, University of Wisconsin, Madison), in *The Journal of Biological Chemistry*, Vol. XXVIII. No. 2, pp. 375-381. Baltimore, Md. January, 1917.

The relation of iodine to thyroid metabolism has recived a large amount of study, but the supply of iodine in food materials had been given no systematic attention until taken up by FORBES and BEEGLE (*Ohio Agricultural Experiment Station*, Bulletin 299, 1916). The results secured by the writer are in agreement with their data.

Three methods for the determination of iodine in organic matter (KRAUSS, HUNTER and KENDALL) were compared, with the result that the method proposed by KENDALL was found to be by far the most accurate.

Corn meal, tankage, commercial meat scraps, clover hay, alfalfa, cabbage, ground oats, oat meal, oats at the period of flowering, very young oats, June grass, timothy hay, wheat flour, sugar beet, milk powder, oil meal, distillers' grain, wheat gluten, oat straw, wheat straw, rape, cotton-seed flour, peas, pea vine, and alfalfa grown in Kansas gave results which on the whole, exclude the presence of as much as 0.003 mg. of iodine in 2 gm. of the substance. Wheat germ, barley, sweet clover and Kansas grown prairie hay possibly showed a trace of iodine, not more, certainly, than 0.005 mg. in a 2 gm. sample. Corn gluten, potato, lettuce and the two natural waters examined showed a distinct trace of iodine ranging from 0.003 to 0.01 mg. per 2 gm. of sample or 1 litre of water, respectively. Samples of rock salt such as are commonly fed live stock, obtained from different mines of the United States, gave in no case any indication of the slightest trace of iodine present.

It would appear that the presence of iodine in feeding materials of vegetable origin is accidental and serves no necessary nutritive function in the plant. Further, the iodine requirements of animals must of necessity be met by traces that occur in plant materials, waters, etc.

344 — **Rudimentary Mammae in Swine, a Sex-Limited Character.** — WENTWORTH, EDWARD N. (Paper No. 2 from the Laboratory of Animal Technology, Kansas Agricultural Experiment Station) in *Science*, New Series, Vol. XLIII, No. 1114, p. 648. Garrison-on-Hudson, N. Y., May 5, 1916.

The inheritance of the rudimentary mammae found on the lower part of the scrotum of the boar and on the inside of the thighs to the rear of the inguinal pair in the sow, was reported as typically sex-limited by the writer in 1912 and 1913. Later, in 1914, due to the failure to discover a boar homozygous for the character, an attempt was made to classify the inheritance as sex-linked in nature. Certain more recent discoveries, due largely to a few selected matings, have cleared up the difficulties which in 1914 were believed to exist, and make the earlier interpretation more probable.

The case in point is as follows: A Duroc Jersey boar possessing the rudimentaries was mated to a grade black sow lacking them. A litter of nine pigs was farrowed, four of the boars having rudimentaries, and one lacking them, while three of the sows lacked rudimentaries and the fourth possessed them. Coupled with the evidence on the inheritance of this

haracter published previously, this breeding performance indicates that oth the Duroc Jersey boar and the grade black sow were heterozygous or this character.

One of the boars possessing rudimentaries from this litter was mated o the four sows of the litter with the following results:

Record Number	Apparent Hereditary Constitution	Males		Females	
		With Rudimentaries	Without Rudimentaries	With Rudimentaries	Without Rudimentaries
Sow 26	R R	4	0	3	0
Sow 27	R r	4	0	3	2
Sow 28	r r	3	0	0	2
Sow 29	r r	4	0	0	4

This breeding performance very definitely indicates that the boar as homozygous for the rudimentary mammae. All of the boar pigs hat he sired possessed the character, even though two of the sows were f a type not to transmit it at all. If he were heterozygous for the character, hen at least part of the seven male pigs from sows 28 and 29 should have icked the rudimentaries; the chances of their all having them being one ut of 128. The discovery of a boar homozygous for the rudimentaries emoves the principal stumbling block to the simple sex-limited theory, dvanced by WOOD.

45 - **Statistical Data Relating to the Age of Cattle Used as Breeders in Maine, United States.** — PEARL, RAYMOND, in *Maine Agricultural Experiment Station, Report of Progress in Animal Husbandry Investigations in 1915*. No. 519-12-15, pp. 19-22. Orono, Maine,

The age of the animals is an important factor in many problems of attle breeding.

The effect of age upon the milk production of a cow is well-known, and he profitable limits of age of a cow as a milker can be determined with recision. No principle of genetic science seems to be more solidly ground- d than that progeny performance is the only test of breeding worth. his principle, however, plays no part in the breeding of a herd, if a herd ull is disposed of before any of his progeny have reached an age when heir performance as milkers can be measured.

These considerations led the writer to collect from the best-known laine farmers and breeders the statistical data given in Table I, which is oth a birth record and a service record.

The chief physical constants deduced from Table I are given in Ta- le II.

These tables present a number of points of interest to the breeder of attle.

TABLE I. — *Showing the Age of Cattle Used as Breeders.*

Age in years.	a) Bulls used as breeders		b) Cows which have dropped one or more calves		c) Heifers bred for their first calves		d) All females (b + c)	
	Absolute frequency	Percentage.	Absolute frequency	Percentage.	Absolute frequency	Percentage.	Absolute frequency	Percentage.
1	213	22.03	4	0.56	69	41.57	73	8.31
2	252	26.06	83	11.66	92	55.42	175	19.93
3	209	21.61	138	19.38	5	3.01	143	16.29
4	149	15.41	101	14.19	—	—	101	11.50
5	52	5.38	80	11.24	—	—	80	9.11
6	53	5.48	69	9.69	—	—	69	7.86
7	24	2.48	66	9.27	—	—	66	7.52
8	8	0.83	44	6.18	—	—	44	5.01
9	3	0.31	44	6.18	—	—	44	5.01
10	—	—	33	4.63	—	—	33	3.76
11	—	—	22	3.09	—	—	22	2.51
12	4	0.41	13	1.83	—	—	13	1.48
13	—	—	9	1.26	—	—	9	1.03
14	—	—	—	—	—	—	—	—
15	—	—	2	0.28	—	—	2	0.23
16	—	—	2	0.28	—	—	2	0.23
17	—	—	1	0.14	—	—	1	0.11
18	—	—	1	0.14	—	—	1	0.11
Total . . .	967	100.00	712	100.00	166	100.00	878	100.00

TABLE II. — *Showing the Chief Physical Constants for Variation in Age of Breeding Cattle.*

Constant	a) Bulls used as breeders	b) Cows which have dropped one, or more calves	c) Heifers bred for their first calves.	d) All females (b + c)
Average age	2.921±0.037 years	5.353±0.075 years	1.614±0.024 years	4.800±0.070 ye
Median age	2.589±0.047 years	4.875±0.068 years	1.652±0.030 years	3.975±0.067 ye
Third quartile age . . .	3.844±0.047 years	7.242±0.093 years	2.103±0.030 years	6.765±0.087 ye
Standard deviation . . .	1.722±0.026 years	2.952±0.053 years	0.468±0.017 years	3.060±0.050 ye
Coefficient of variation .	58.94 ±1.18 %	55.16 ±1.19 %	28.84 ±1.14 %	64.05 ±1.39

The average age of the herd bulls used to sire the 967 calves includ in the statistics was just under 3 years. The median age of these he bulls was approximately 2 ½ years. This means that 50 per cent of t calves were sired by bulls *under* 2 ½ years old ; 75 per cent of all the cal (as shown by the third quartile age) were sired by bulls less than ab

/4 years at time of service. Less than 15 per cent of the calves were ed by bulls 5, or more, years old.

The importance of this fact cannot escape the attention of breeders. bull must be at least 3 years old before the breeder can possibly have r opportunity of testing the milk producing capacity of its progeny, but 9 per cent of all the calves figuring in these statistics were sired by bulls ler 3 years of age.

More than half of the calves produced in a given interval of time are ed by bulls about whose ability to transmit milking qualities nothing inite can be known. If the same conditions regarding cattle breeding thods obtain in other places generally, it is not remarkable that pro- ss in milch cattle selection is so slow.

In the female part of the herd the selection conditions are better. If exclude heifers bred for their first calves, the average age of the breed- cows is, approximately, 5 1/2 years. This is the age when, on the ave- e, cows are nearly, if not quite, at their best as regards milk production.

Out of 878 calves, 166, or 18.9 per cent, were the first calves of heifers. e average age of these heifers when successfully served for these first ves was about 1 year and 7 months. 3/4 of the heifers were served be- e they were 2.1 years old.

- A Jersey Cow which Earns $ 367 Per Annum in the United States. — *Hoard's Dairyman*, Vol LII, No. 20, p. 690. Fort Atkinson, Wisconsin, December 8, 1916.

The cow here representnted is 8 year old and produces annually 321 lbs. of milk containing 841 lbs. of fat. It earns $ 367 per year its owner Mr. R. S. SANDFORD and its numerous descendants follow ts footsteps.

Jersey Cow, Melia's Laune of Alba

347 - **The Influence of the Plane of Nutrition of the Cow Upon the Composition a Properties of Milk and Butter Fat; Experiments Carried Out in America.** — ECKLES C. H., and PALMER, L. S., Influence of Over-Feeding, in *University of Misso College of Agriculture, Agricultural Experiment Station Research Bulletin* No. 24, 39 pp. 8. IV Tables, 4 Fig. Columbia, Missouri, May 1916. — II. Influence of Under-Feeding, i *dem* No. 25, 107 pp. 26 + XI Tables, 15 Fig., November 1916.

During lactation, a cow fed a normal ration uses the food for 2 ge neral purposes: 1) for maintaining her body; 2) for producing milk. I more, or less, food is given than the animal requires for these purposes, th ration is supernormal or subnormal.

The writers undertook to study experimentally the effect of these rations upon the cow, especially from the point of view of the compositio of milk and milk fat.

I. — *The Influence of over feeding.* — The experiments concernin the influence exerted by overfeeding the cow during lactation fall into classes: 1) cases where a normal plane of nutrition prevailed previous t overfeeding, and 2) those cases where overfeeding was preceded by a sub normal plane of nutrition. In both series of experiments, observation were made as to: 1) the weight of the animal; 2) the milk flow; 3) th percentage composition of the milk constituents; 4) the physical and che mical constants of the milk fat.

The outstanding features of the results were that over feeding cause the cow to gain in weight, but exerted no influence toward abnormality in th composition of the milk, or the physical and chemical constants of th milk fat. The beneficial effects of overfeeding are especially shown in t 2nd series of experiments, where the composition of the milk, as well the constants of the milk fat, were abnormal at the beginning of overfee ing. The result of overfeeding in each case, was to restore the abnorm composition to the normal one.

The data seem to warrant the general conclusion that normal mil and butter are to be expected when the cow is on a supernormal plane nutrition, as well as when the plane of nutrition is normal.

The results of the overfeeding experiments on the milk flow of th animals are very interesting. Only in certain cases did an increase in th plane of nutrition above normal raise the flow of milk, and the influenc was very limited. It only occurred when the normal milk production ha been reduced by the preceding subnormal ration.

At present, it is generally accepted by physiologists that the phen menon of milk secretion is due to a chemical stimulus, or " hormone carried by the blood. It appears also to have been demonstrated that th secretion of milk is controlled by the central nervous system, either throug secretory nerves, or vasomotor fibres. The result of these experiment on supernormal feeding also indicates that the secretion of milk is regulat by at least 2 factors; the one chemical and the other nervous. The chemic stimulus predominates immediately after parturition and fixes t maximum milk flow for each individual, which is more or less fixe being a hereditary and physiological character. The chemical stimul received at parturition is more or less independent of the plane of nutriti

the cow, for the chemical stimulus of milk prodution could not be increas- by super-nutrition during the 1st period of lactation immediately xceeding parturition.

As the lactation period advances, the chemical stimulus for milk se- tion is gradually replaced by a stimulus with entirely different character- ics This, the writers have designated as the nervous stimulus; it entirely dependent upon the plane of nutrition of the cow. As soon as : nervous stimulus for the secretion of milk predominates, the milk w is readily affected by a subnormal plane of nutrition and can more- er be partially restored to its former figure by increasing the plane of trition.

II. — *The influence of underfeeding*. Subnutrition was first, like super- trition, studied from the quantitive point of view only. The qualitive e (proteins, carbohydrates, and fatty substances considered separately) ll be studied in subsequent experiments. The experiments carried out ted from 7 to 36 days, and the rations given were from 15 to 70 per cent. the normal amount.

The chief factors influencing the effect of under-feeding are : the stage lactation period — the degree of underfeeding — the character of the ion — the state of flesh of the cow — the plane of nutrition previous to derfeeding — the length of the under-feeding period.

A subnormal plane of nutrition causes a cow in lactation to lose more less weight according to the influence exerted by other factors. The ects of a subnormal plane of nutrition on the milk flow depends on the stage of the lactation period at the time of underfeeding. Its tion is very limited immediately after parturition. Cows subjected to a bnormal plane of nutrition immediately after parturition, maintain their lk flow at a nearly constant level under the most adverse conditions. In e experiment, a constant flow was maintained for 30 days with sufficient od for body maintenance only. A decline in milk flow accompanies en moderate underfeeding when the lactation period has reached a cer- n stage. The exact point when this occurs was not determined in the periments. The explanation of this difference in the effect of the milk w is believed by the writers to rest upon the conception that the milk oduction is stimulated, as in the case of supernutrition, by 2 factors, the e chemical and the other nervous. Physiological underfeeding (which produced naturally, especially after parturition, in a fat animal having strong stimulus for lactic secretion) and the reduction in the plane of trition from a high to a normal plane are invariably accompanied by a rked increase in the percentage of fat in the milk, particularly when the w has a surplus store of fat on her body.

In the case of physiological underfeeding, there is almost invaria- y an actual increase on the yield of milk fat, as well as of the percentage the milk.

The effects of an induced subnormal plane of nutrition on the percent- e and yield of fat in the milk are variable, an increased fat percentage metimes resulting; in other cases there is no such change, while, in

others, an actual decrease in the percentage of fat results. The factors that appear to cause these variations are the state of flesh of the animal, the degree of underfeeding, and the season of the year.

A subnormal plane of nutrition at times affects the percentage of protein in the milk; in other cases, it causes a decline in the percentage of casein. When it decreases the total protein, the ash percentage is also diminished.

All types of underfeeding have marked effects on the physical and chemical constants of the butter fat in the milk, which are characterised by a decline in the Reichert-Meissl number and saponification value and an increase in the iodine value. The melting point increases, becomes stationary, and decreases according to the different cases. These differences are due to the respective increase and decrease in the volatile fatty acids and in the oleic acid. The former have a much greater influence than the latter upon the melting point of butter fat. Maize silage and other feeds which increase the volatile fatty acid content of butter fat, affect the degree of abnormality of the fat constants accompanying underfeeding, but not their amount of change. The effects of underfeeding on the fat constants appear to reach a limit with a subnormal plane of nutrition of about — 40 per cent. Long continued underfeeding results in more or less recovery of the fat constants, but the recovery is never complete. The increase in the percentage of milk fat which accompanies underfeeding is not satisfactorily explained by the hypothesis that submutrition causes transfer of tissue fat to the mammary glands, for blood fat analyses failed to show any increase in the amount of fat carried by the blood. The writers suggest that this phenomenon may perhaps be explained by supposing that the synthesis of milk fat in normal amount and its synthesis with normal composition are independent physiological functions. The production of the normal amount of milk fat is controlled by the activity of the lipases and other enzymes which accelerate this synthetic reaction in the mammary gland, and is influenced greatly by changes in the general metabolic activity of the body, particularly by the changes that affect fat metabolism.

By this hypothesis it is possible to explain the normal variations in the percentage of fat in the milk, the variations which occur with extreme weather conditions, are well as the variations in the effects of underfeeding on the percentage of fat in the milk, especially those that appear to be related to the fatness or thinness of the cow.

The synthesis of milk fat of normal composition is controlled by variations in the quantity and quality of the materials presented to the milk glands by the blood stream, from which the normal constituents of the milk fat are formed, particularly those which especially characterise the milk fat, namely, the volatile fatty acids. A further extension of this phase of the hypothesis is limited by the lack of knowledge as to which constituents of the blood are utilised for the formation of normal milk fat.

The effects of underfeeding on the composition and properties of milk and butter fat show the importance of controlling this factor in feeding

eriments involving the effects of specific feeds on the composition of milk
butter. The effects of underfeeding must be taken into account in the
rpretation of all data involving variations in the composition of milk
butter fat due to specific conditions of the cow, changes in the feed of
cow, or to feeds of specific character.

The variations in the composition and properties of milk and but-
fat due to the underfeeding of the cow may have an important bearing
the use of such milk for human food, particularly as a food for infants.
ther experiments are, however, necessary before it will be possible to
e how much bearing the results have in this connection.

- **The Value of Silage.** — DORMAN, J. E., in *Hoards' Dairyman*, Vol. LII, No 23, pp. 800 and 820. Fort Atkinson, Wisconsin, December 29, 1916.

Because there is no market for silage, other than through live stock,
e has been much speculation as to what it is really worth as a feed for
y cows.

Dairymen know in a general way that it is worth all it costs to grow
harvest it, hence, they continue to build silos and fill them.

Through analysis and comparison with other feeds, silage is placed as
one-fourth as valuable as timothy hay, or $ 4 per ton when timothy
is worh $ 16.

In actual feeding practice silage contains certain other properties that
it value far beyond what the analysis shows.

The dairymen know that their live stock thrive better and that they
less sickness in their herds when silage forms a part of the winter
on.

The figures below indicate that silage does play an important part in
ing up the milk flow, which would, without this succulent feed, con-
e to decrease. While this experiment is not extensive enough to be
lusive, it does indicate to a certain extent what takes place in many of
herds that are being fed silage, and also indicates, that silage is really
h more than is generally estimated.

Forty cows from a herd of 71 were selected for this test. These cows
freshened prior to September 1st. and all continued in full flow of
through September, October and November.

The results of the test are summarized in the following table:

	Production	
	Milk lbs.	Fat lbs
September: Pasture, hay in rack, and grain	28 241	929,8
October: Pasture, hay in ruck, and grain	25 518	843,1
November: Hay and silage	20 028	925,2
Decrease: September to October	2 723	86,7
Assuming like decrease October to November	2 723	86,7
Total decrease without silage would have been	5 446	173,4
November yield with silage was	20 028	925,2
Without silage would have been	22 795	736,4
Total decrease without silage would have been	6 233	168,8

From the above figures, we deduce the following values:

Value of increased butterfat at 27.5c.	$ 46,42
Value of skimmilk at 25c per cwt.	15,58
Total value of increased production.	$ 62,00
Increase to each ton silage fed.	3,44
Each ton of ensilage fed replaced:	
330 lbs. grain valued at $ 1 per cwt.	3,30
600 » hay » » » 5 per ton.	1,65
Value ton of ensilage.	$ 8,39

The value of both grain and hay has approximately doubled since this experiment was conducted.

349 – **Care, Feed and Management of the Dairy Herd in Iowa.** — KILDEE, H. H in *Sixteenth Annual Iowa Year Book of Agriculture*. pp. 495-532. Des Moines, Iowa, July 1, 191

The dairy cow fits admirably in diversified and intensive-farming Dairy farming is therefore rapidly increasing in popularity in almost ever section of Iowa where land is constantly getting dearer. In Jersey an in Europe, where ground rentals run from $ 50 to $ 60 an acre, and i Holland where farms rent from $ 30 to $ 40 an acre, the dairy cow is th foundation of Agriculture.

Dairy Farming increases soil fertility. — Dairy farms increase rathe than decrease in soil fertility. Many Iowa farms which were formerl very poor from the fertility standpoint have been built up in a few yea through feeding the crops and purchased supplementary feeds to dair cows.

Economy of production. — Economy of production is another facto in favor of the dairy cow, which, for every 100 pounds of digestibl nutrient consumed yields about six times as much edible solids in the milk when beef or mutton is produced. In addition to being an economica producer, the dairy is a more dependable source of profit than the bee steer, because her products are but slightly affected by market fluctuation and because she is a continuous source of revenue. Then the skim milk a valuable by-product of the creamery, has a high feeding value and en bles poultry and pig raising to be carried out successfully.

The milking machine an economic factor. — Milking machines are now giving satisfactory results on a great many Iowa dairy farms. They wi remove the greatest obstacle to dairying — that of securing competen milkers.

Iowa's average production low. — In spite of the fact that dairy cow as a class are very economical producers, many cows milked in Iowa a present do not pay for their feed. The average amount of butterfat pr duced by the cows in Iowa does not exceed 140 pounds a cow per yea At the same time there are many animals in the state that have produce over 500 pounds, several have exceeded 700 pounds, a few 800 pound while the Guernsey cow Dairy Maid of Pinehurst produced 910.67 pounds

tter fat in one year. The world's record for all breeds is 1116.05 pounds butter fat produced in one year by the junior three-year-old Holstein, nderne Holingen Fayne. The Holstein cow, Lilly Al Corta, bred in Iowa, lds the world's milk record for one year with 30 451.4 pounds of milk.

Considering the fact that the cost of keeping a cow is not in proportion her production, the present low average is unsatisfactory. About one ird of the so-called dairy cows of Iowa are poor animals in conforma- n or productive ability; nearly one half of the remaining cows only oduce about one half of what they are capable of producing if properly red for.

One Iowa Herd Improved. — The following records made by the herd Peder Pederson & Son in the Benson Cow Testing Association in three nsecutive years is especially interesting and valuable in this connection it shows what can be accomplished on the farm by keeping records, proper feeding and management, and weeding out the poor cows.

	Average Milk per cow	Average Butter fat per cow, lbs	Net Income per cow over Cost of feed
1911	5665 pounds	267.7	$ 32.12
	Largest net income cow in herd		84.22
1912	7060 pounds	251.9	53.96
	Largest net income cow in herd		106.30
1913	9607.47 pounds	341.98	75.00
	Two largest net income cows in herd		144.00

This herd was made up of grades and a few pure-bred Holsteins.

Selection of cows. — Jerseys and Guernsey cows are noted for their econo- ical production of a high percentage of butterfat, especially under intensive ming conditions. The Holsteins are very popular in Iowa because they e able to use large quantities of farm-grown feeds, the milk being very luable in raising calves, pigs and chickens. The Ayrshire breed is noted r its ruggedness and yields a fair quantity of milk and butterfat.

As a matter of fact, however, the breed is of less importance in select- g the cow than is individuality, for in every breed there are good indi- duals and poor individuals. It is of utmost importance to demand iry cows of proper form and type, but the milking performance of a cow id the performance of her ancestors, especially her paternal grand dam, ould be considered in selecting her.

Selection of bulls. — Many of the best breeders of dairy cattle select ills almost entirely on the individuality and performance of the dams. etter results could be attained by buying mature, tried bulls, although is is not very usual. A good dairy sire that will raise the average produc- on of the herd 50 to 100 pounds of butterfat is worth a good price.

Selection of Feed-Stuffs. — Rations for dairy cows should be: palatable, ilky, succulent, of well-varied composition, and suitable for feeding.

Balance of nutrients. — The best combination of digestible nutrients, rotein, carbohydrates, fats and ash, will vary with the individual cow, the

quantity and quality of milk she gives, the prices of feed stuffs, and whether she is in calf or not.

Cows that tend to become too fleshy need less carbohydrates and more protein in proportion, and cows with the opposite tendency more carbohydrates. Where cows are fed maintenance rations, insufficient for milk production, body tissue is sacrificed in order that the cow may secrete milk and the milk flow declines rapidly after 5 or 6 months. In some cases this lack of persistency is due to inherited characteristics as well as to failure to feed for milk production.

Where the dairy farm produces clover, alfalfa, oat and pea hays, a large amount of the only nutrient the farmer needs to buy, protein, is secured cheaply.

Silage and its efficiency. — No dairy farm is complete in its equipment without at least one silo for winter feeding and one with a smaller diameter for summer-feeding. Good corn silage is pre-eminently a feed for dairy cattle. It is palatable, succulent, bulky, beneficial to the digestive tract and economical. Most dairy farmers in the corn belt realize that to secure the largest possible profits from a herd of cows they must feed corn silage. In regions where corn cannot be grown sucessfully for silage many dairy men have silos in which they cure other crops.

Experiments have shown conclusively that silage is far superior to shock corn or hay in milk production. Silage fed cows produced from 11 % to 18 % more milk than cows fed fodder from the same acreage. The two most common succulent feeds for winter are corn silage and roots. It has been found that the silage, as compared to roots, yields more heavily to the acre, costs much less and gives equal results from similar weight of dry matter. Silage is also very desirable for the herd during the latter part of July and the month of August, when the pastures are usually very short, due to hot weather and lack of rainfall. The value of silage, or soiling crops at this season, does not lie solely in the temporary increase in milk flow, but also in maintaining it. If a cow once declines in her milk flow it is practically impossible to bring her back to normal for the remainder of her lactation period.

Soiling Crops. — The pastures upon most Iowa farms do not furnish enough feed for the cattle during the hot, dry months of summer. The problem of supplying the necessary succulent feed most economically is solved by: *a*) better care and management of pastures; *b*) use of summer silo; *c*) use of soiling crops. The succession of soiling crops used on the Iowa State College Dairy Farm is given below.

Approximate Time of Cutting	Crops	Approximate Time of Sowing	Rate of seeding per acre	Average yield of green food per acre
ıne 10 to June 15 .	Alfalfa	Spring or Aug.	20 lbs.	8 tons
ıne 15 to July 5 .	Oats and Canada field peas	April 5	1 ½ bus. oats 1 ½ " peas	5 "
ly 1 to July 10 . .	Oats and Canada field peas	April 20	1 ½ " oats 1 ½ " peas	5 "
ly 10 to July 15 .	Alfalfa	Spring or Aug.	20 lbs.	4 "
ly 10 to July 20 .	Amber fodder cane	May 5	70 lbs.	20 "
ly 15 to Aug. 15 .	Fodder cane and cow peas	May 15	30 lbs. cane 1 bus. cow peas	12 "
ug. 15 to Sept. 20 .	Fodder cane and cow peas	June 10	30 lbs. cane 1 bus. cow peas	12 "
ept. 20 to heavy frost	Millet	July 10	3 peck	3 "

Increased production of milk from decreased acreage has been the re-ılt secured at the college dairy farm from this system of soiling crops. ; was found in 1912 that the entire cost of pasture and soiling crops for ach cow, counting rent of land labour, seed, etc. was only $ 0.62 for the ntire pasture season.

Preparing the cow for her year's work. — The proper time to begin eeding a cow for milk production is six to eight weeks prior to freshening. he should have at least this length of time to rest and prepare for the ext lactation period. The feeds given at this time should meet the fol-owing requirements: Rest and cool out the digestive tract, supply nou-shment for the growth of the fœtus, and build up the flesh and strength f the cow herself.

Care of cow first thirty days after calving. — If the cow has been pro-erly cared for the first three days she may then be placed on dry and ore solid food.

The manner in which she is fed during the next thirty days deter-ines largely the character of the work she will do during her lactation eriod.

Without doubt parturition weakens the digestive apparatus and heavy eeding soon after calving is liable to be followed by indigestion, or impac-on, but during this time if properly cared for, the cow can be brought to er greatest possible milk flow.

Amount of feed. — The best ration will depend upon the condition, ndividuality and record of the cow, but it is a common practice in Iowa o allow 1 pound of grain for each 2 ½ to 4 pounds of milk produced, de-ending upon the richness of the milk, or 7 pounds of grain for each pound f butterfat. In addition to this grain ration the average cow receives 1 o 1 ½ pounds of clover or alfalfa hay and 2 ½ to 3 pounds of corn silage or each 100 pounds live weight.

The following mixtures meet the requirements of a good grain mix-ure to be fed in conjunction with corn silage and alfalfa hay, provided the eeds can be bought at a price which will make the ration comparatively conomical:

Sample mixture A

400 pounds cracked corn or corn and cob meal
200 pounds ground oats
100 " cottonseed meal
100 " oil meal

Sample mixture B

400 pounds cracked corn
200 " oil meal
100 " gluten feed
100 " dried brewer's grain

Sample mixture C

400 pounds corn and cob meal
100 " ground oats
100 " gluten feed
100 " cottonseed meal
100 " oil meal

Sample mixture D

300 pounds corn and cob meal or cracked corn
200 pounds oil meal
100 pounds cotton seed meal

Feeding grain in summer. — Dairy farmers are divided in their opinion as to whether it pays to feed grain when the cows are on pasture. The practice of many successful dairyman, and the one in vogue at the college dairy farm, is to give the animals no grain the first month they are on grass. Thus they secure a rest. Later a small quantity of such feeds as cracked corn, cottonseed meal, ground oats, etc. should be given the heavier producers in addition to the silage or soiling crops to keep the cows up in flesh and production.

Encourage persistency of large milk flood. — In order to induce persistency the following points must be observed in addition to weeding out the non-persistent animals: 1) proper feeding, 2) breeding to calve in fall of year, 3) proper milking and manipulation of udder, 4) regularity, 5, kindness, 6) grooming, 7) watering, 8) salting, 9) keeping flies from cows, 10) sheltering.

Influencing butterfat production. — Butterfat production can only be increased with certainty and sufficiently by obtaining a large and persistent flow of milk. However it is evident that each of the following factors may have a slight influence upon the per cent. of fat in the milk: breed, individuality, age, period of lactation, condition, excitement, frequency of milking, season of year, temperature, feed, whether first or last drawn milk and grooming.

Rearing the calves. — During the first three weeks of the calf's life after being taken from the dam it should be fed from 2 to 3 ½ pounds of freshly drawn whole milk three times a day. When the calf is three weeks of age it may be fed twice a day, and skim milk can gradually and slowly be substituted for a like amount of whole milk. In three more weeks the calf should be having a whole ration of skim milk. When it reaches the age of six weeks it should be receiving from 12 to 16 pounds of warm milk a day. Great care should be taken not to over-feed the calf with milk. At the college farm best results are secured by 16 to 18 pounds a day when on full feed. It is usually advisable to continue the skim milk feeding until the calf is about eight months old.

Grain ration to calves. — A grain ration of equal parts corn, oats and bran, with a small quantity of oil meal, should be provided for the calf. Calves dropped in the fall and early winter will do well on pasture the first

DAIRY FARM DEPARTMENT, Iowa State College, Ames, Iowa.

Days after calving	114 days
Age	5 years 1 month 25 days
Date Photo taken	19 Febr. 1912

Photograph

Name: *Lucy Duchess De Kol*
Registry No. *96 348*
Dropped: *20 December 1906*
Sire: *Count De Kol Clothilda Bawn* No. *30 609*
Dam: *Lucy Duchess Lyons* No. *78 965*
Bought of: *Esther A. Horr*
Final disposition

Breed: *Holstein*
Advanced Registry No. *16 079*
Bred by: *Esther A. Horr*
Bred by: *Esther A. Horr*
Bred by: *Esther A. Horr*
Address: *Wellington, Ohio*

Herd No. *45*
Class:
Address: *Wellington, Ohio*
Address: *Wellington, Ohio*
Address: *Wellington, Ohio*
Date of Purchase: *3 December 1907*

PRODUCE RECORD.

	Date Bred	To Sire	No.	Due to calve	Date Calved	Weight Calf	Sex	Herd No.	Name of Calf	Registry No.	Purchaser	Address	Date Sold	Price	Kind of Stock Kept
1	12 Jan. 1908	*Colantha 4th's Lad*	26 940	21 Oct. 1908	23 Oct. 1908	97	M	83	*Prince De Kol of Ames*		*Sweeney Bros.*	*North Buena Vesta Iowa*	Jun. 1909	$ 75.00	Pure bred + grades
2	18 Aug. 1908	*Id.*	26 940	27 May 1910	29 May 1910	100	M	113	*Sir Colantha De Kol Lad*		*W. S. Whitaker*	*Hillsboro Iowa*	Mar. 1911	$ 200.00	grades
3	17 Jan. 1911	*Id.*	26 940	24 Oct. 1911	27 Oct. 1911	102	M	159	*Duke Colantha De Kol*		*Oak Park Academy*	*Nevada Iowa*	Jun. 1912	$ 150.00	Pure bred + grades
4	12 June 1912	*Id.*	26 940	21 Mar. 1913	(Twins)	75	M	210							
					22 Mar. 1913	70	M	211							
5	03 July 1913	*Sir Jessie Burke.*	41 215												

MILK AND FAT RECORDS.

	Yearly Milk and composite Fat Records										Official Records									
	Lactation Period		Length Period		Age at Start			Pounds Milk	Pounds Fat	Per Cent Fat	Net Income over Cost of Feed	Test Period		Length of Test		Age at Start			Pounds Milk	Pounds Fat	Per Cent Fat	Pounds Butter
	From	To	Mont.	Days	Years	Mont.	Days					From	To	Mont.	Days	Years	Mont.	Days				
1	27/XI/1908	26/XI/1909		365	1	11	7	10,257.70	316.03	3.10	$ 49.85	16/X/1911	22/X/1911		7	4	10	7	405.80	15.504	3.82	
2	30/V/1910	30/V/1911		365	3	5	11	13,519.40	440.07	3.25	$ 88.14	16/X/1911	16/X/1912		365	4	10	7	16,994.90	552.770	3.25	
3	16/X/1911	16/X/1912		365	4	10	7	16,979.00	543.69	3.20	$ 124.79											

On the back of the Record Sheet there is a reproduction of the genealogy of the animal, including 16 ascendants for the pure bred animals (8 ascendants for grade animals, only the paternal ascendancy having a recorded genealogy). This Record Sheet contains furthermore all prominent sons and daughters of the ascendants, their Register number and their milk and butter fat records for the mothers as well as for the daughters of the famous bulls.

summer if provided with some grain and shade, while calves dropped in the spring or early summer are much better off when properly cared for in the barn during the first summer.

Substitutes for milk. — There are several calf meals on the market which seem to give very good results especially when fed in addition to a small quantity of milk. The following mixture gave the best results at the Pennsylvania Experiment Station:

Wheat flour 30 lbs., cocoanut meal 25 lbs, " nutrium " 20 lbs, oil meal 10 lbs, dried blood 2 lbs.

In feeding, the milk substitute was mixed with warm water at the rate of one pound for six pounds of water and fed from a bucket. The calves were given their mother's milk for about a week and then the milk substitute gradually replaced the milk, until at the end of two weeks no milk was given. During the first five or six weeks the calves were given about two pounds of the mixture per day. From this time on until calves were 100 days of age they were fed two and a half pounds a day. After this age they were fed a grain and hay ration. The results, while not equal to those when milk was used, were satisfactory and good dairy heifers were raised at low expense.

Feed and care required by dairy heifers. — The following are excellent rations for yearling dairy heifers during the winter months:

I.		II.	
Silage	20 lbs	Clover or alfalfa hay	15 lbs
Clover or alfalfa hay	8 lbs	Grain	1 lbs
Grain	2 lbs.	Roots	20 lbs.

III.

Clover or alfalfa hay	15 lbs
Grain	3 lbs

It costs from $ 50 to $ 60 to grow a dairy heifer up to producing age.

Feed and care of the dairy bull. — A too liberal ration of silage is not good for the herd bull. In addition to a small quantity of corn silage alfalfa or clover hay should be fed and a grain ration of corn, oats, bran [illegible] oil meal.

Herd Records. — The following records, requiring but very little time and effort should be kept: production of milk, production of butterfat, feed records and breeding records. The large record sheet in fig. 1 illustrates an excellent method of keeping these records adopted by the Dairy Farm Department of the Iowa State College, Ames, Ia.

350 - **Ewes' Milk. Its Fat Content and Relation to the Growth of Lambs.: Studies Made in the united States.** — RITZMAN, E. G., in *Journal of Agricultural Research*, Vol. VIII, No. 2, pp. 29-26 Washington, January 8, 1917.

In the course of the sheep-breeding experiments carried on at the New Hampshire Agricultural Experiment Station, some observations were made on the comparative milk yields and tests of their fat content (1) for 6 di-

(1) See also: B. 1916 No. 539; Tests on Milking-Ewes in Hungary for Yield of Milk and Wool.

stinct mutton breeds and 11 types of first-generation crosses. Attention was especially paid to the milk-yielding characters of early-maturing mutton breeds of sheep, for the necessity of obtaining good early lamb for sale emphasises the importance of selecting breeding ewes with some regard to their potentialities as milkers.

The data available on the subject indicate that ewes' milk has a much higher average of fat than cows' milk, but one of the interesting features of ewes' milk is the great variation in the product of single individuals at different periods during lactation or during different lactation periods. There exists apparently very little difference in this respect between breeds selected for large milk yields and those that are not bred especially for milk, including the more common English breeds and those of the Merino type.

Of the milk-breeds, HUCHO gives the analyses of milk from 3 East Friesian ewes, showing the ranges respectively of 4.32 % to 10.80 % — 4.35 to 7.50 % and 4.15 % to 7.88 %. BESANA gives 9.50 % as the average fat-content of 176 samples from an Italian breed, the samples representing a period of 21 days after lambing. TRILLAT and FORESTIER report 6.98 % as the average of 10 samples from the ewes of the Roquefort region of France and SANNA gives 7.53 % as the average of 55 samples from sheep of southern Sardinia. For the non-milk breeds, FULLER and KLEINHEINZ of the Wisconsin Agricultural Station give the following analyses: Oxford, 7.05 %; Southdown, 7.4 %, Dorset, 7.2 %; Shropshire, 5.88 %; Merino, 6.00 %, and Montana 7.15 %. These figures represent the averages of several individuals of each breed which compare very closely with the averages obtained by the writer at the New Hampshire Agricultural Station, where the average was 6 % for the cross-breeds tested with variations between a minimum of 2.4 % and a maximum of 12.1 %. If the fat content of the milk of ewes of different ages is considered, we have the following general average: 2 years, 5.8 % — 3 years, 6.2 % — 4 years, 6.2 % — 5 years, 6.38 % — 6 years, 6.6 % — 7 years, 5.3 % — 8 years, 10.7 % (for a Southdown ewe). The respective ranges are: 2 years, 2.7 to 9.5 % — 3 years, 2.4 to 11.4 % — 4 years, 3.5 to 12.1 % — 5 years, 2.4 to 10.5 % — 6 years, 3.0 to 9.0 % — 7 years; 3.6 to 7.0 %. In view of the great variations between sheep of the same breed, or cross, the averages for the different breeds and crosses lose most of their significance on account of the small numbers available.

From an examination of the data obtained by the writer, it appears that there is a remarkable variation in the fat content of the milk of individual ewes, independently of their age or breed and that the fat content of the milk of the same ewe varies considerably in different lactation periods, and often at various stages of the same period.

Fat is still quantitatively the most variable factor of the solids in the milk of breeds of animals in which selection has been practised for generations to increase the fat content. Such selection has so far failed to stabilise the percentage of fat in milk, partly because no definite limits have been set to the standard. In mutton breeds of sheep, in which no endeavour has been made to modify the fat content, or increase the milk yield, by selection,

there exists apparently an equally unstable variation as regards the per centage of fat in milk. These variations are only of importance in the latte case, in as much as it may be a limiting factor in the rapid growth of th lambs. The researches of the writer in this direction tend to show tha there is no very definite relation between the fat percentage and the increas in weight of the lambs, for the highest gains were obtained from mill varying in fat from 2 to 3 per cent. and the lowest gains from milk testing to 10 per cent. or over. The limiting factor seems rather to be the quantity of milk within the limits shown in the following Table.

Average increase of Lambs in Weight at 8 Weeks on Varying Quantities of Dams' Milk Varying in Fat.

Number of Ewes	Milk yield (estimated)	Average fat test	Fat content per cent									
			2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	10 or over	Average
			Weight Increase									
			lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
13	High.	4.82 %	42.0	33.0	29.0	38.2	34.0	42.0	29.0	—	—	34
78	Good.	6.15	32.5	31.0	36.0	31.0	32.0	33.0	31.0	25.0	25.0	29
35	Fair.	6.05	—	25.0	22.5	27.5	26.5	24.0	26.0	25.0	22.0	24
12	Poor.	6.03	—	15.0	21.0	19.0	26.0	19.0	22.0	—	9.0	19
138			*Average:* 37.0	26.5	27.1	30.0	29.6	29.5	27.0	24.0	18.7	—

The difference in weight increase between lambs from high-milkin ewes and good-milking ewes is 16 per cent.; between high-and fair-milkin ewes 38 per cent. and between high — and poor-milking ewes is 79 per cent

The writer deduces from these figures that the milk, though normall poor in fat, always contains sufficient for the requirements of growth, pro vided it is furnished with a sufficient amount of albuminoids and miner substances (especially lime) to satisfy the needs of the young growin animal.

An examination of the growth curves shows the great uniformity growth in the 4 different groups, and a maximum increase between the 4t and the 8th weeks followed by a slight increase between the 8th and 12t weeks, when the lambs had free access to a liberal amount of grain and ha which they ate greedily.

Apart from the influence of inherited capacity, mast has limitations promoting net increase dependent on rate of growth. Growth in its tur is notd ependent on mast. Its limitations are set mainly by inherited cap city and an abundance of proper food. In other words, weight increase fro mast can only be relative, whereas growth is not limited in the same sens Recent investigations into the nature of growth give added significance the importance of an abundant supply of whole milk during the earlier st ges of adolescence. These concern not only the specific functions of t

various ash constituents, in metabolism, but also the newer interpretations of the structural differentiation among the various amino-acid derivatives of protein and their respective effect on growth. Protein under these circumstances loses its generic value, and its character and source become a matter of as great importance as its quantitative sufficiency.

351 - **Egg-Laying Record of White Leghorn Pullets.** — HANSON, S. G., in *The Journal of the Board of Agriculture*, Vol. XXIII, No. 10, pp. 997. London, January 1917.

The following egg-laying record of a flock of 750 White Leghorn pullets bred, reared, housed and fed by the writer, has been communicated to the Board of Agriculture. This account of the results obtained by Mr. S. G. HANSON is likely to interest large poultry keepers. The Board are in no way responsible for the figures, which, it may be remarked, are not applicable to those who keep poultry on a small scale in conjunction with farming or gardening.

The monthly wholesale, price the eggs realised in London, is also given, together with the amount allowed for feed. The latter figure is approximate, but fully covers all charges for feed, labour, fixed charges, and railway carriage. The pullets were hatched during April, May, and June 1915, and the egg-laying record is from November, 1915, to October, 1916.

Month	Year	Eggs Laid	Price per dozen wholesale	£	s.	d.
November	1915	698	2/9	8	0	6
December	»	5 393	3/2	71	10	2
January	1916	10.831	2/5	108	19	10
February	»	13 078	1/9	95	5	9
March	»	16 384	1/6	102	7	6
April	»	16 974	1/6	88	8	1
May	»	15 216	1/6	95	2	0
June	»	13 064	1/9	95	4	0
July	»	12 901	1/11	103	0	5
August	»	10 790	2/3	101	2	3
September	»	7 066	2/8 1/2	74	12	6
October	»	3 246	2/10	38	5	0
		125 641		981	18	0

Amount realized	£	981	18 0
Less cost of feed, labour, railway carriage, upkeep of houses and yards, etc.	£	468	15 0
Net profit on flock of 750 pullets	£	513	3 0
Average per bird 167 1/2 eggs.			
» » » realised in cash	£	1	6 2
Cost of feed, labour, railway carriage on eggs, fixed charges, etc. per bird.	£	0	12 6
Net profit per bird	£	0	13 8

352 – Study of the Genital Functions of the Silk Moth in Relation to the Orientation of the Cocoons. — SACCHI, ROSA, in *Le Stazioni Sperimentali agrarie italiane*, Vol. L, No. 1, pp. 25-32. 3 figs. Modena, 1917.

VERSON in 1894 and KATO in 1913 both observed that the silk-worm, when about to turn into a chrysalid, endeavours to take up a position with the head upwards and that in the majority of cases the chrysalid places itself upright in the cocoon with the head in the vertical position. KATO has questioned whether this position is not injurious to reproduction, for chrysalids enclosed within cocoons placed vertically rest with their whole weight upon the abdominal extremity, which becomes flattened and pressed out of shape to the detriment of the genital organs. (1) Other scientists (MOZZICONACCI, GIUSEPPINA RAVENNA) have repeated these experiments and obtained divergent results. The present writer has now repeated them in his turn at the R. Istituto Superiore Agrario of Perugia, upon the races: "Giallo Ascoli", "Giallo Abruzzo", "Incrocio Chinese oro". His observations confirm those of BERSON and KATO.

Silkworms of the "Incrocio Chinese oro" race were distributed on a faggot of broom placed vertically and others of the same race upon another faggot placed horizontally. Among 20 cocoons of the 1st group (A) it was observed that the chrysalid had the abdominal segments deformed; among 20 cocoons of the 2nd group (B), all the chrysalids were normal; 17 pairs of moths belonging to group A and 16 belonging to group B showed no difference in behaviour at mating; on the other hand, at oviposition, group A furnished a lesser weight of eggs than B, a larger number of sterile eggs and a much larger number of eggs remaining in the ovarian duct. (See appended Table).

It is consequently advisable in breeding for reproduction purposes to place the broom in a horizontal position, resting it, for instance, on hurdles similar to those in general use for ordinary rearing purposes. With such an arrangement, the silkworm generally makes its cocoon with the long axis oriented in the horizontal sense. In this way the chrysalis has the head and abdomen at the same level, thus allowing the abdominal extremity and reproductive organs to acquire their normal formation to the advantage of egg production.

Behaviour at oviposition of moths derived from vertical cocoons (group A) compared with that of moths from horizontal cocoons (group B).

	Group A	Group B
Number of layings	317	16
Total weight of eggs	3.021 gr.	3.311 gr.
Average weight of eggs at one laying	0.177 gr.	0.206 gr.
Number of sterile eggs	536	150
Number of complete layings	4	12
» » incomplete »	13	4
Minimum number of eggs remaining in ovarian tubes *	1	3
Maximum number of eggs remaining in ovarian tubes	437	12

* In this race, a moth with normally formed addomen had, previous to laying, an averag of 462 eggs in the ovarian tubes.

(*Ed.*).

(1) See also B. 1916 N°. 327.

Sericulture in Spain: Average Returns from Silkworm Rearing in Normal Years; Government Encouragement of the Industry. — *Ministerio de Fomento, Dirección general de Agricultura, Minas y Montes, Servicio de Publicaciones agrícolas, Hojas divulgadoras*, Year X, No. 20, 7 pp. Madrid, October 1916.

A propagandist article published with the object of encouraging the worm industry in Spain. In normal years the average returns are as ended:

EXPENSES.

ance of selected seed	12.00	francs
g. of mulberry leaves at 5 fr. per 100 kg.	45.00	"
days work by head of family occupied with the rearing	24.00	"
reams of used paper as bed for silkworms and for collecting cocoons at 3 fr. per ream	6.50	"
rucks of branches at 1.50 fr. each	3.00	"
Total expenses	90.50	francs

RECEIPTS.

kg. of cocoons at 2.50 fr. per kg	241.50	"
Net Profit	151.00	"

With the object of developing the silkworm industry in Spain, the law March 4, 1915 (the text of which was published the following day in *Gaceta oficial*) provided for the following: 1) Free distribution to farmers mulberry seedlings of the proper varieties in as large quantities as possible; warding of money-prizes of 50 francs per 100 mulberry trees in normal ing and intended for silk-worm rearing 3) Awarding of prizes of 25 fr. 100 meters of mulberry trees trained "en espalier" and per 100 feet ulberry planted in lines; 4) Awarding of a subsidy of 0.50 fr. per kg. esh cocoons produced in Spain; 5) A subsidy of 0.25 fr. per kg. of fresh ish cocoons reeled in Spain.

The same law also provides for the following measures: 1) Develop- t of the official Departments for the selection and distribution of n seed, and for instruction in the cultivation of mulberries and in silk- n rearing; 2) Formation of nurseries of the best varieties of mulberry.

The customs duties are raised to 4 gold francs per kg. of twisted silk o 5 gold francs per kg. of twisted silk bleached or dyed, imported from ad.

For the above purposes a sum of 840 000 fr. has been provided for in stimates, dating from 1915.

New Freezing Process for the Preserving of Fish. — KALLERT E., in *Zeitschrift für Fleisch und Milchhygiene*, 26th Year, Part 23, pp. 353-355. Berlin, Sept 1, 1916.

The writer describes the process recently invented by OTTESEN for preservation of fish, already patented in a large number of States and roughly tested in Germany. It consists in freezing the fish by plunging into a strongly refrigerated salt solution. The idea of using a cold olution is not, of course, new but OTTESEN has given it a form capable

of practical utilisation. The greatest difficulty was that of preventing th salt of the solution from penetrating into the fish. OTTESEN has elimi nated this drawback by employing a salt solution very far from reachin the saturation point when it is lowered to the temperature of the freezin process (— 15° C). Such a solution cannot lose salt to the fish which ar immersed in it; on the contrary it possesses the faculty of itself absorbin more salt.

A previous refrigeration of the fish in iced water is, however, necessar because: 1) when the fish are plunged into the solution, the temperature this latter rises and reacquires its faculty of yielding salt to them as long temperature of solution and fish are different; 2) the almost immediate free ing of the external layers of the fish presents the salt from penetratin

Exact determinations of the salt content in a number of frozen fi showed that an absolutely minimum quantity of salt penetrated the sk and the immediately adjacent flesh. In these portions only 0.24 to 0.42 of NaCl was found as against 0.1 % of natural salt content. Similar r searches on fish frozen in a more highly concentrated solution gave, accor ing to the degree of saturation, a proportion of salt varying from double sextuple. As long as the saturation point of the solution is not reache white, snowy masses of pure ice continue to form. The type and quanti of ice formed serve as useful guides as to whether the solution is at t required concentration.

The apparatus required for working the process is relatively ve simple. The solution is poured into an isolated tank and kept constant and vigorously in movement by means of an agitator. The necessary cold transmitted to the solution by means of a system of refrigerating pipe the source of cold being a refrigerating machine. The size of the tank a of the machine is determined by the quantity of fish to be frozen.

In a basin of 2 cubic metres capacity 197 cwt. of fish can be frozen 24 hours. Further the frozen fish should be kept till required in premi where the temperature is lowered to about — 7° C.

The advantages of the system are as follows: *a*) All loss of weight evaporation of water is totally avoided; *b*) the fish retain an appearance freshness; *c*) the rapid freezing saves considerable time and space, and t muscular tissue undergoes considerably less change.

The economic advantage lies chiefly in the fact that the market m be kept regularly supplied with perfectly fresh fish from the most dist fishing grounds. The necessary plant may also be installed on vessels.

The writer intends giving later an account of this process as appl to meat-storage.

355 - **The Muskrat (*Fiber zibethicus*) Injurious to Fish and Aquatic Bird Bavaria and Bohemia** (1). — KOPP, G. and MAIER, H. N., *Account of an expedition study the Muskrat in Bavaria and Bohemia*, in *Allgemeine Fischerei-Zeitung*. Yea No. 3, pp. 33-37; No. 4, pp. 49-52. Munich, Feb. 1 and 15, 1917.

The muskrat obtained access to Bohemia and Bavaria in 1804 and s that time has become established to an ever increasing degree. Realising

(1) See also; B. 1915, Nos. 242 and 417 — B. 1916, No. 215. (Ed.)

danger of this increase in numbers the Bavarian Home Office has issued an order empowering the local authorities of Lower Bavaria, the Upper Palatinate and Upper Franconia to instruct the persons hereafter mentioned to deal with this animal and to communicate their observations to the authorities in question: huntsmen — fishermen — owners of factories — officers belonging to the agricultural department — foresters — Customs officers — water bailiffs — road inspectors etc. At the same time, the Munich "Biologische Versuchs-Station für Fischerei" and the "Bayrischer Landesfischereiverein (Bavarian Society for Pisciculture) received considerable sums to be distributed as rewards for capture.

No method has yet been found, either in America, Bohemia or Bavaria, for checking the multiplication of the muskrat. Consequently it was decided to have recourse to observations upon the biology of this animal with a view to acquiring new principles on which to found on efficacious method of control. With this object the Home Office appointed a Commission, the members being Prof. RÖRIG, a member of the Imperial Biological Institute at Dahlem-Berlin and Drs. G. KORFF and H. N. MAIER (authors of the article here summarised). In the autumn of 1916 (13th to 20th October) the Commission visited the principal localities of Bavaria and Bohemia where muskrats are taken and thus obtained first-hand information as to the advantages and drawbacks of the different methods of control.

The first 3 days, when various spots of Lower Bavaria and Bohemia were visited, no observations of importance were made. Among other points the remains of muskrats were found in the properties of the Grand-dukes, and a partridge skeleton was found in the lair of one of these rodents. At two places *Cysticercus fasciolaris* was found in the liver of the muskrat.

On the 4th. day the Commission visited the district of Frauenberg where the animal multiplies very rapidly. A steep river bank, an unlikely spot to the uninitiated, revealed the quarters of a veritable colony, thanks to the *scent of a good dog* (a method to be recommended). Digging operations at the 1st. nest enabled 8 muskrats to be taken. Unfortunately, digging results in damage to banks and dykes exceeding that caused by the galleries of the animals themselves.

Smoking out was next tried by introducing into an exit passage opening under water a cartridge of "citrocid" (manufactured by HINSBERG at Nackenheim on Rhine) and at the same time blocking the other galleries by means of nets. Shortly after the introduction of the cartridge the animals appeared, were caught in the nets and were taken alive. This method, in the opinion of the Commission, seemed capable of giving fairly good results; it has the great advantage of not damaging dykes and banks, but for use on a large scale the above-mentioned cartridges are relatively dear, consequently the Commission recommends the use of paper or dry reeds in their place, as these latter give equally good results. After 3 hours work, over 200 meters of bank, 38 muskrats were captured, of a total weight of 13 kg. It may be imagined what an amount of damage these would have been capable of producing, though according to the fishermen, the muskrats

cause considerably less damage by direct destruction of the fish than by their perpetual harassing in winter time.

In order to gain an idea of the frightful fecundity of these animals it may be mentioned that several litters are frequently found in the same nest; a female has even been found not yet weaned and already pregnant.

The fourth day was closed by a dinner consisting mainly of muskrat meat, when the members of the Commission were able to confirme the reputation already acquired by this dish in America.

On the 5th. day, the Commission visited some ponds at Blatna where careful study was made of the method of working of the *floating barrel trap*, which has already been tested in the original home of the muskrat. This is a barrel half full of water with a large square bunghole, and planks about a foot in length attached to the ends in order to prevent the barrel from revolving. The muskrats, when in the water, are accustomed to take an occasional rest on some floating object or other, consequently they perch readily upon the margin of boards. They then look for a hiding place in the tub and drown. As an additional attraction a bait of parsnip or carrot is placed with in the barrel; care must be taken to renew the bait daily. At Blatna this system gave very good results. In the space of one month some thirty muskrats were captured, as many as 8 fell into the barrel in one night.

On the 6th. day the Commission visited Schlüsselburg where the pest made its first appearance in 1908. Three years later (1911) ten muskrats were counted, in 1913 about 300 and, in 1916, more than 1000. The damage caused to the fish was not enormous: one case only was found where the muskrats had devoured the head of a fish and about a hundred carp fry (in one night), and on another occasion they attacked a carp which had come close into the bank. The damage done to the ponds themselves was much more important. For protecting the dykes and banks of ponds and preventing the animals from burrowing, clinker proved to be the best material. The barrel traps were of not much use in a pond as the muskrats had covered the bung-holes with reeds and so converted the traps into floating homes. In a much larger pond it had been noticed that, since the appearance of the muskrats, the aquatic birds, previously very numerous, had decreased considerably is number; it was also seen that the pests, after destroying the eggs and young, had taken possession of the floating nests of the aquatic birds and turned them to their own use.

Finally the muskrats had done large damage to an osier-bed at the edge of the pond. The stems had been gnawed to such an extent as to give the plantation the appearance of a field of stubble.

FARM ENGINEERING.

356 - **Improvements in the Galardi-Patuzzo Motor-plough.** — TARCHETTI, A., in *Il Giornale di Risicoltura*, Year VI, No. 23, pp. 353-356, 2 fig. Vercelli, December, 1916.

The new type of GALARDI-PATUZZO motor-plough (Verona, Italy), succesfully tried in cultivating rice fields in November 1916 at Ponzana (Novara Province, Italy) under the auspices of the Experimental Station for rice-growing at Vercelli, does not differ, in size and general char-

acter, from the type of the year before (1). A few changes have, however, improved the working of the machine by allowing:

1) Easier steering, more or less indepedently of the form or position of the plough body;

2) More easy regulation of the plough-bodies and their work;

3) The work to be started more quickly and also the inverse for turning.

To facilitate steering, the play between the plough-beam and the machine has been increased either by spacing the two hooks that join the beam-forks to the frame, or by replacing the axis (which originally joined the beam to the perforate vertical bar that regulated the depth of the plough-bodies) by a pulley which can slip over a horizontal guide attached to the beam.

The increased play makes the adjustment of the attachment bars easier, for they have sufficient movement independently of the position of the beam, and consequently of the plough bodies, so that is is not necessary to move the buried plough bodies, as was previously necessary to obtain a rapid and large change of direction.

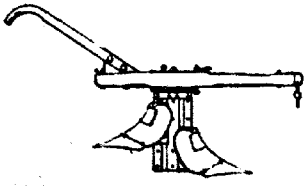
This independence of movement between power and resistance has another considerable advantage for use in rice fields, as the beam can be altered within wide limits, and also the fore-socks can be put in position more easily for there was no place for them in the first semi-rigid types.

In order to regulate the plough bodies more easily, the two ends of the attachment fork of the beam can be regulated as to height by means of a screw and a crank-wheel so that they can be altered in position while the work is going on as can be done in ordinary ploughs.

A new change is in the land grips on the wheels; the hooks are removed, being replaced by a simple arrangement of levers and springs which allows of setting all the grips in about a minute and putting them out of work as soon as the work is finished, and of replacing them by wooden shoes forming a tyre for the wheels during transport and preventing the mud from entering the grooves between the grips.

7 - **The Dowling Plough.** — *Scientific American*, Vol. CXVI, No. 2, p. 68. New York, January 13, 1917.

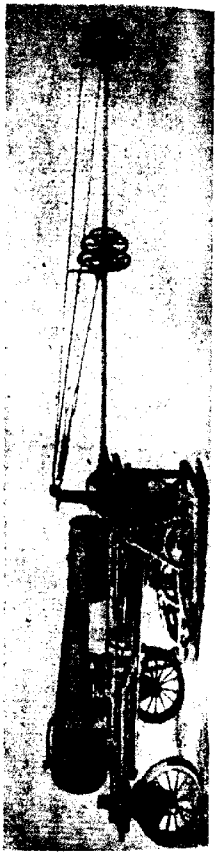
This plough invented by J. DOWLING, Powell, Wyoming U. S. A., has a pair of ploughshares placed back to back on the plough standard



DOWLING PLOUGH.

(1) See *B*, 1913, No. 1074. (*Ed.*).

and a beam adapted to be turned through an angle to present either o the said ploughshares at the front. The ploughshares are separatel mounted on the plough standard for vertical sliding movement an there are means for simultaneously sliding the ploughshares in opposit directions to raise either share and depress the other to working position on the standard.



358 - Bates-Joliet Tractor with Extensible Steering. — FRÉMIER, VICTOR, in *Le Génie Rural*, Year 8, New Series No. 6 (No. 66), p. 10, 3 fig. Paris, 1916.

The JOLIET OIL TRACTOR COMPANY has fitted an extensible steering wheel in the rear of its tractors, so as to allow the driver to be seated behind the plough or binder and at the same time to drive the tractor and control the implements being hauled.

This tractor has other interesting features : extensible guide (front wheels) and behind a caterpillar tread. If an obstacle is met with, the anterior part of the tread can move round the axle of the driving wheel which is placed behind. In this displacement the tread is guided in a vertical slot fixed under the girders of the chassis.

The contact area of the tread is about 5.5 sq. ins. which gives sufficient grip to enable the tractor to haul a 3 share-plough, working at a depth of about 8 ins.

To increase its grip, the tread has an ingenious arrangement which causes the draw-bar to act on a lever attached at its upper portion to the girders of the chassis and placed diagonally under it, as that the lower end of the lever presses on the axis of the central roller of the tread.

Motor: 4 cylinder; 13 HP. at draw-bar.
2 *Speeds*; about 2 and 3 miles per hour.
Weight: 35 cwt.
Dimensions: 11 ft. long by 80 ft. wide by 6 ft. high.
Price (in America): under £ 200.

- **Potato Dibblers: 1) "Burgess", 2) "Atherton's Simplex".** — *The Implement and Machinery Review*, Vol. 42, No. 302, pp. 1122-1123. London, February 1, 1917.

1) The Burgess dibbler, built by Messrs G. C. OGLE & SON, Derby, kes holes in the ground for the reception of seed potatoes. The wheels re a convex tread which holds the sides of the drills back while the es for the potatoes are being made. The wheels are also split and grooved

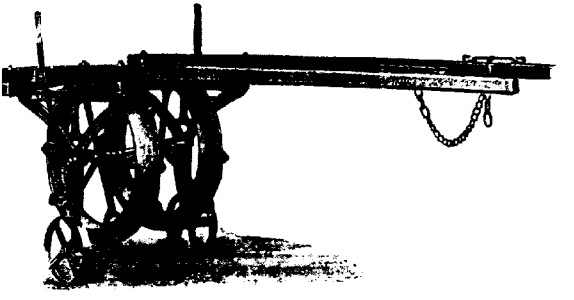


Fig. I. — Burgess's Dibbler.

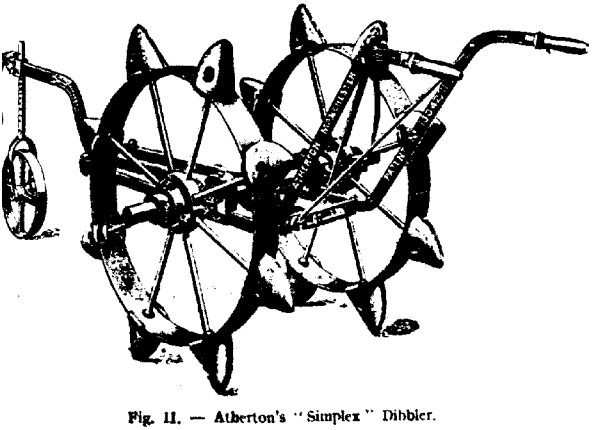


Fig. II. — Atherton's "Simplex" Dibbler.

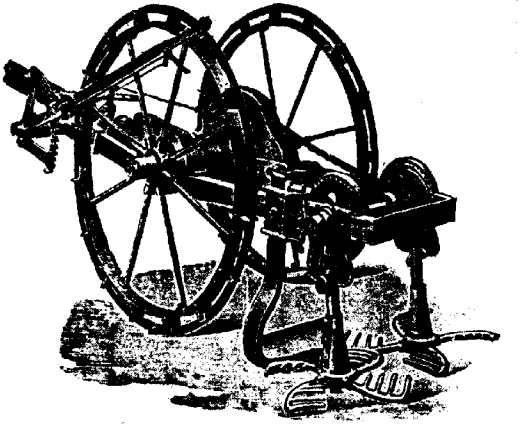
that the dibbles or hole makers can be moved any required distance apart. template being provided to ensure their quick and even spacing.

2) Atherton's "Simplex" Marker, made by W. ATHERTON, Manches- r, carries on its axle two large steel wheels, upon the rims of which are ced the dibbles, these being made in halves and so formed as to clasp e outer edges of the wheels. By loosening the nuts holding the dibbles

together they can be shifted to various positions so as to make holes either 12, 14, 16 or 18 inches apart. Being without shafts or pole the machine can be turned on a narrow headland. It can further be converted into a hoe or scarifier by adding a set of tines and clips.

360 - **The "Marvel" Potato Digger.** — *The Implement and Machinery Review*, Vol. 4 No. 502, p. 1132, 1 fig. London, February 1, 1917.

The "Marvel" potato digger made by Messrs A. BALLACH & SONS has two reels which are chain-driven. Dividers are used to raise the tops towards the centre of the drill, and the reels act as a rotary riddle underneath the soil as it leaves the share. The potatoes are brought to the surface and spread out to a width of from 3 to 4 ft.



The "Marvel" Potato Digger.

The shares and reels are adjustable to suit varying conditions of soil; roller and ball bearing reduce the draught so that the machine can be easily worked with two horses.

361 - **Grain Driers Now in Use in Germany.** — See No. 373 of this *Bulletin*.

362 - **A New Machine for Peeling Citrus Fruits.** — HOOD S. C. in *United States Department of Agriculture, Bulletin* N° 399, pp. 13-19, figs 6-10. Washington, D. C., December 10, 1

This peeling machine has been constructed by the United States Department of Agriculture, patented under U. S. Letters Patent N° 1 186 and is dedicated to the public. The machine has been thoroughly tested at Orlando, Fla., and it has been found that by its use one man can in one hour remove the peel from 2 tons of oranges or from 3 1/4 tons of grapefruit. The peel comes from the machine in a finely divided condition suitable for the extraction of the oil, and the peeled fruit is delivered in

ondition suitable for use in the manufacture of various food products. It is unnecessary to sort the fruit prior to putting it through the machine.

DESCRIPTION OF THE MACHINE. — The machine consists of four essential parts, as follows :

1) A rapidly revolving drum which removes the peel by a grating action on the fruit.

Machine for Peeling Citrus Fruits.

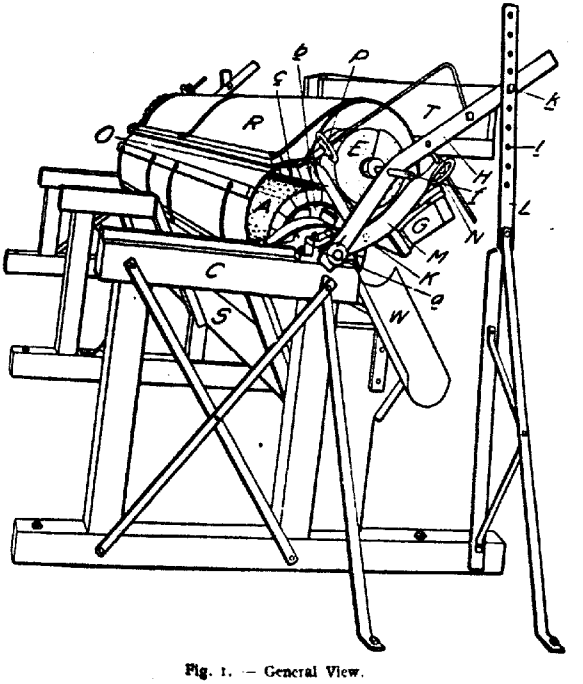


Fig. 1. — General View.

2) A spiral feed screw which carries the fruit along the drum, at the same time rotating it in a forward direction so that the peel is removed in the form of spirals.

3) A feed table of special construction which serves as a support for the fruit while passing through the machine.

4) An adjustment mechanism to vary the relative position of the

drum, feed screw and table, in accordance with the character of the fruit to be handled and the degree of its ripeness.

The details of the machine as they appear in both perspective and cross section are shown in figures 1 to 4.

The lettering of the various parts of the machine is the same in all of the figures.

The drum (figs. 1, 2 and 3, *A*) — The drum is 11 feet in length and is made in two parts, each 5 feet 6 inches long, since it is found that if it is built in one piece there is a tendency to sag in the middle, thus causing great vibration when run at the necessary speed. Each part is built of narrow staves 2 inches wide and 1 1/8 inches thick, bolted to 3 cast-iron pulleys 10 inches in diameter and 3 inches face, which are placed one at

Machine for Peeling Citrus Fruits.

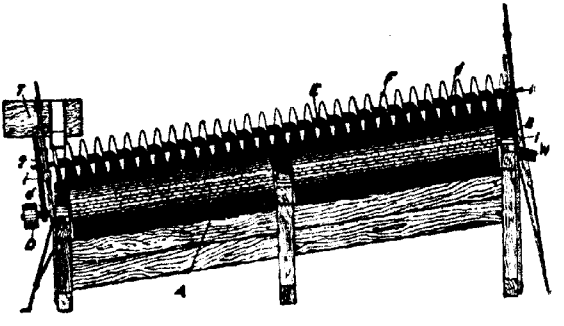


Fig. 2. — Longitudinal view of the machine with cover removed, showing arrangement of drum and feed screw.

each end and one in the middle, being mounted on a shaft 1 3/16 ins. in diameter.

The end pulleys are set on the shaft, with the hubs inside, and the middle pulley is equidistant from the ends.

When all the staves are in place, the drum is turned either on a lathe or on the machine.

The grating surface of the drum is made of No. 24 galvanized iron, cut into strips 4 inches wide and punched to form the special teeth required. These teeth are formed by a triangular punch with two sides straight and the third beveled to form the point. The teeth are from three-sixteenths to one-fourth of an inch long, with the point raised from three thirty-seconds to one eighth of an inch. They are about three-fourths of an inch apart each way and so placed that when the strips are in position on the drum the teeth will project in the direction in which the drum rotates.

The strips are wound spirally on the drum until it is entirely covered ıd are then nailed down smooth with No. 3 nails placed about an inch part. It is essential that no sharp corners or edges of the metal be left rojecting, since these will cut the fruit and cause trouble.

Machine for Peeling Citrus Fruits.

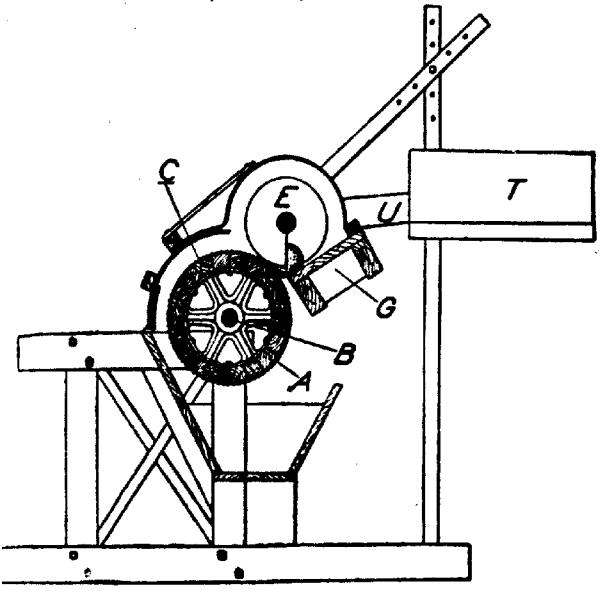


Fig. 3. — Transverse section.

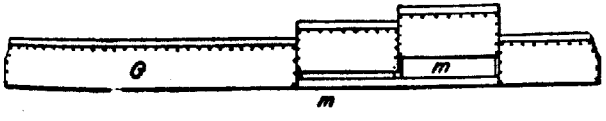


Fig. 4. — Upper face of feed table.

The *frame* (figs. 1 and 2) is made of pieces 4 by 4 inches mortised ogether and properly braced with iron. At the lower end of the nachine the frame is 20 inches high and at the upper end 32 inches high, o that one end of the drum is 12 inches higher than the other. The frame

is fastened to the floor by lag screws, the ends being further secured by iron braces.

The feed screw (figs. 1, 2 and 3, *E*) is the same length as the drum. It is built with 2-inch galvanized-iron pipe as a shaft, on which is soldered a spiral made of 22-gauge galvanized sheet iron. The flights of the spiral are 3 1/2 inches high and 4 inches apart, and are set on the shaft so that they project forward about 15°. The faces of the flights are punched thickly with the 3-cornered punch, forming points about one-eighth of an inch high on the forward face. This screw is supported by pieces of 3/4 inch shaft set in sleeve collars held inside the pipe by screws. The shaft need not extend more than 2 feet into the pipe at each end.

The feed table (figs. 1, 3 and 4, *G*) consists of a wood or iron frame 9 1/2 inches wide, running the entire length of the machine under the feed screw. The top of the frame is covered with a 10-inch board, which is cut into sections as shown in figure 3. These sections are held in place by some sort of fastening on the outside edge, so that they can be drawn out at will. The upper surfaces of these slides are covered with galvanized iron, tecthed on the inside half in the same manner as the flights of the feed screw, but with the teeth a little smaller.

The adjustment mechanism (fig. 1). — The feed screw *E* is supported at each end by an iron bar *H*, attached at the lower end to a babbitted collar *a* on the drum shaft and held at the other end by a vertical standard *L*, in which are several holes *r* for receiving the bolt *k*. The hole in the iron bar *H*, through which the feed-screw shaft *f* extends, should be at such a distance that when the feed-screw is in place there will be about one-half inch clearance between the edge of the screw flights and the drum. In case the machine is to be used a great deal, the bearing for the shaft of the screw at *f* in the arm *H* should be reinforced by a babbitted bushing to prevent wear. The short arm *M* is attached at the lower end to the same collar as *H*, and the other end rests on the wheel nut *N* running on the rod which is secured at the upper end of the arm *H*. By means of this wheel nut the outer end of the arm *M* can be raised and lowered.

The feed table is supported by an iron arm attached underneath and forming a brace to hold the parts of the frame in position. This arm is carried up to the level of the top of the table and bent at right angles to extend in the same plane as the top of the table. At *K* this arm is secured by a bolt to the arm *M* and in then bent upward at right angles, forming the lever *O*. At the top this lever receives the iron rod and rests against the wheel nut *P*. By means of this wheel nut the incline of the feed table is changed, moving on the bolt *K* as a pivot. It is essential that the centre of the bolt *K* should be in the same plane as the surface of the drum and so arranged that the inside edge of the slides forming the top of the table should be about three-eighths of an inch from the drum.

The shaft of the drum should be furnished with a pulley of 8-inch face, of the proper diameter to drive the drum at 600 revolutions per minute. The feed screw is furnished with a large sprocket wheel at

ven by a small sprocket on the drum shaft, of the proper size to turn feed screw at 150 revolutions per minute.

The peel receptacle. — Underneath the drum is a trough made of or galvanized iron to receive the finely divided peel. This trough ends nearly to the floor and toward the front of the machine to a vertical line from the outer edge of the feed table. The back of the trough ends upward to the top of the frame and to it are attached removable vers which entirely inclose the drum and feed screw. These can easily removed for clearing and for removing the peel which adheres to them.

OPERATING THE MACHINE. — The fruit to be peeled is placed in a ge box (figs. 1, 2, and 3, *T*), the bottom of which is a few inches higher an the top of the drum at the lower end. From this box a narrow spout g. 3, *U*) extends to the edge of the feed table. The fruit rolls into this out and is fed by hand, one at a time, between the two lower flights of e feed screw (see fig. 3), one being delivered at each revolution of the ed screw. The fruit is carried along by this screw in contact with the um, which removes the peel by grating. As soon as the fruit comes in ntact with the rapidly revolving drum it tends to spin rapidly in the posite direction, but this is sufficiently retarded by the toothed surce of the table, which supports it, so that it is acted upon by the teeth the drum. The toothed flights of the feed screw tend to roll the fruit rward on the table, so that the peel is removed in a series of spirals. The eled fruit is delivered from the spout *W* (figs. 1 and 2).

In adjusting the machine for work, the weight which the fruit presents the drum can be changed by raising or lowering the arm *H* on the standrd *L* (fig. 1). By means of the wheel nut *P*, the table can be inclined so to increase or decrease the angle made with the drum. The smaller this gle is the more tendency there is for the fruit to be pinched against the um and the more severe the grating action. The wheel nut *N* raises lowers the arm *M*, so that the table may be kept at the proper distance om the feed screw.

CHANGES REQUIRED FOR THE VARIOUS CITRUS FRUITS. — The dimensions as given are those suitable for oranges or lemons. If it is wished use this machine for peeling grape-fruit a feed screw having flights of the oper size can be constructed and installed in the same manner as has en described. In the case of limes, the screw can be made smaller and orter.

3 - **Tipping Trailers.** — *The Implement and Machinery Review*, Vol. 42, No. 502, p. 1131, 2 fig. London, February 1, 1917.

The traction wagon and trailer industry has made great progress of e years. Thus, Messrs RUSTON, PROCTOR & Co. Ltd., of Lincoln provide o types of trailer of interest to agriculturists, one side-tipping and the her end-tipping.

The first (fig. 1) can be tipped on either side and only requires one man operate the mechanism even when fully loaded. During the operation tipping, the bottom of the trailer, at the side to be depressed, automatic-

ally draws clear of the door, which remains in its normal position. Or moving the wagon forward the whole contents are discharged completely

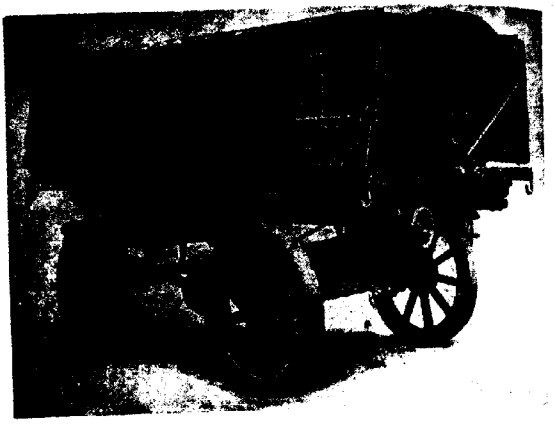


Fig. I. — Ruston, Proctor & Co. side-tipping trailer.

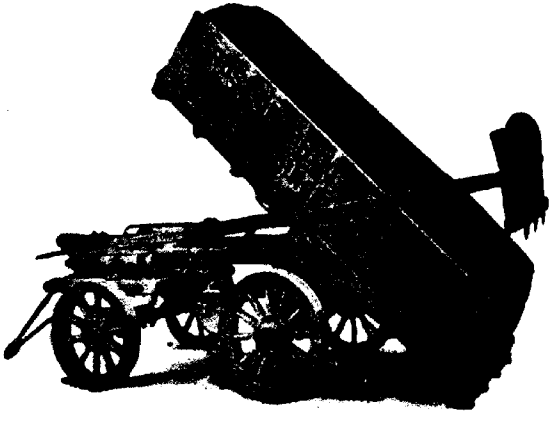


Fig. II. — Ruston, Proctor & Co. end-tipping trailer.

without needing any shovelling.

The end-tipping model (fig. 2) can discharge its maximum load in

minutes. By turning a crank the front end of the trailer body is released rom the tail board which remains in its normal position, thus allowing a ree outlet for the material.

54 – Review of Patents.

Tillage Machines and Implements.

itish India	2 758 Clod breaker attachment for ploughs.
nada	172 252 Road Grading and Ditching Machine.
	172 272 Harrow.
	172 292 Cultivator Device.
	172 300 Agricultural machine.
	172 331 Ditching machine.
	172 653 Earth cutter.
ited Kingdom	101 993 — 102 756 Cultivators.
	102 890 Ploughs.
ited States	1 210 511 Motor-cultivator.
	1 210 795 Harrow.
	1 210 901 Plough attachment.
	1 211 241 Agricultural implement.
	1 211 358 Harrow attachment.
	1 211 565 Tractor for ploughs.
	1 211 968 Plough-hitch.

Manures and Manure Distributors.

ada	127 242 Fertiliser composed of calcium cyanamide, ammonium sulphate and acid phosphate.
zerland.	74 586 Liquid-manure cart.
ed Kingdom	14 662 — 14 663 Processes for making calcium cyanamide.
	102 403 Process for making potassic fertilisers.
ed States	1 210 636 Fertiliser distributor.
	1 211 836 Fertiliser attachment for seed planters.

Drills and Sowing Machines.

da	172 280 Planter.
ed States	1 211 004 — 1 211 205 Markers for planters.
	1 211 305 Maize Planter.
	1 211 596 — 1 211 603 Planters.
	1 211 929 Grain drill.
	1 211 861 Potato-planter.

Cultivators etc.

	172 434 Pruning Implement.
	172 551 Weeding machine.
Kingdom	102 760 Pruning Implement.

Control of Diseases and Pests of Plants.

	172 516 Moth trap.
	172 685 Fly catcher.
l Kingdom	14 902 Insect traps.
	15 256 Animal traps.

Reapers, Mowers and Harvesting Machines.

Canada	172 185	Harvester machinery
	172 211	Bean harvester.
	172 267 — 172 268 — 172 835	Harvesters.
	172 329 — 172 749	Shocking machine.
	172 762	Harvester for standing grain.
Switzerland	74 587	Mowing-machine.
United Kingdom	13 029	Combined swath-turner and side-dellvery rake.
	15 293	Flax-harvester.
United States	1 210 958	Cotton-harvesting machine.
	1 211 100	Corn cutter.
	1 221 627	Grain binder.
	1 211 880	Shocking machine.
	1 211 972	Mowing machine.
	1 212 011	Canvas platform for binders.
	1 212 044	Combined hay-rake and baler.
	1 212 058	Grass-seed harvester.
	1 212 061	Bean and Pea Harvester.

Machines for Lifting Root Crops.

Canada	172 443	Beet lifter and digger.
United Kingdom	14 737	Root lifter and digger.
United States	1 211 030	Beet lifter and digger.

Threshing and Winnowing Machines.

Canada	172 404 — 172 637 — 172726	Threshing machinery.
	172 651	Wild oats separator.
	172 655	Grain separator.
United Kingdom	15 243	Pea-shelling machine.

Machines and Implements for the Preparation and Storage of Grain, Fodder, etc.

Canada	172 193	Vehicle for grain shocks.
	172 271	Grain car door.
	172 338 — 172 339 — 172 340 — 172 582	Nut blanching machines.
	172 604	Dumping wagon.
	172 690	Freight and stock car.
	172 711	Dehydrating mechanism for fruit and vegetables.
	172 800	Hay drier.
	172 805	Silo packer.
	172 828	Loader for sheaves.
United Kingdom	14 899 — 14 900 — 14963	Machines for depericarping palm-nuts.
United States	1 210 393	Hay stacker.
	1 212 094	Machine for bunching hay.

Forestry.

Canada	172 197	Tree felling machine.

Agricultural Tractors

United States	1 211 216	Tractor.
	1 211 565.	Tractor for ploughs, etc.

Feeding and Housing of Live Stock.

nada	172 482 Horse detacher.
	172 535 Cow tail holder.
nited Kingdom	13 002 — 14 569 — 14 570 — 14 777 Horseshoes.

Aviculture.

nada	172 164 Egg crate.
	172 327 Incubator.
	172 436 — 172 646 Hen nests.
	172 490 Fountain for poultry.
	172 515 Poultry feeder.
	172 595 Brooder.
	172 648 Egg candler.
	172 919 Egg preserving process.
ed Kingdom	14 829 — 102 815 Poultry food.
	102 653 Egg marker

Farm Buildings.

erland	74 589 Forcing frame.
ed States	1 211 643 Windmill attachment

Industries connected with Plant products.

ish India	2 759 Treatment of sugar cane juice.
ada	172 671 Milk manufacture from ground-nuts
	172 817 Scutching machine.

Dairying.

ada	172 204 Milk cooler.
	172 464 Churn
ed Kingdom	14 575 — 14 502 Milking machines.
ted States	1 210 468 Milking machines.

Various.

ada	172 625 Flower holder.
	172 856 — 172 904 Cleaner for containers.
	172 857 Container washing machine.

- **Hygienic Drinking Trough with Separate Compartments.** — *Scientific American*, Vol CXVI, No. 2, p. 66 + 1 fig. New York, Jan. 13, 1917.

To prevent the spread of disease, particularly glanders, among horses, rinking trough has been invented in the United States which prevents the ses from all drinking in the same water.

The trough containing several basins, just large enough to admit muzzle of each horse, and in which the water enters from the bottom flows away over the upper edge. Thus, there is a continuous stream vater which flows away by the waste pipes.

One of these drinking troughs was tested in the winter of 1916 and it found that it worked in any weather. Thus, at a temperature of 2° C., no ice formed in the basins or in the trough.

AGRICULTURAL INDUSTRIES.

366 - **Variations in the Glucometric Index of Musts coming from the Same Vines in Different Years.** — MARESCALCHI A., in *L'Italia vinicola e agraria*, Year VII, No. 5, 68-69. Casal Monferrato, February 4, 1917.

The following figures, obtained by the writer from Sig. FRANCESO MARESCALCHI, Director of the Cooperative Wine Vaults Society formed by the vine proprietors of Retorbido di Voghera in Pavia, provide striking confirmation of that well known fact of the influence of the year on the wines. They show the glucometric index of grapes coming from *the same property* and *the same vines* in different years, and prove that, in the same vine, cultivated similarly by the same owners, the alcohol produced by the sugar in the grape can vary up to 2.2 % from one year to another.

Glucometric index of musts from the same vines in different years.

Years	Vine I	Vine II	Vine III	Vine IV
1909	16.7	17	18.2	17
1910	17.6	16	17.8	17.4
1911	17.1	16	18.6	16.6
1912	18.8	17.8	20.5	17.6
1913	18.7	16.9	18.4	18.5
1914	19.3	16.9	20	16.7
1915	19.8	18.8	19.9	18
1916	17.3	17	18.7	16
Maximum variations	3.1	2.8	3.5	2.8

367 - **On the "Casse blanche" (1) of Wines.** — FONZES-DIACON, in *Comptes Rendus des Séances de l'Académie des Sciences*, Vol. 164, No. 4, pp. 199-200. Paris, January 22, 1917.

In a work on the "casses" of wines (published by Coulet, Montpellier 1902), BOUFFARD records a white one characterised by a milky opalescent change which finally becomes a whitish deposit. This "casse" is caused through oxidation by the air and takes place in spite of heating, sulphur dioxide and even tartaric acid; the colour of the wine is not affected.

According to BOUFFARD, the deposit, consisting of oxidised matter contains lime and possibly iron. Only citric acid can prevent it from being formed.

(1) "Casse blanche" refers to a change caused by bacterial or chemical action in wine exposed to the air. (*Ed.*)

As the writer had to examine a white wine strongly attacked by a ilar "casse", he was able to find the composition of the deposit obtained the prolonged action of a current of air. The white deposit, which be- s greyish when dry, contains both organic and mineral matter; there ery small amount of lime and a little more iron which is combined phosphorus to form basic ferric phosphate $Fe_2O_3(P_2O_5)_2$ which SAN found to be soluble in citric acid. The change only takes place sulphurous acid, contained in every white wine, is oxidised; as the um is no longer a reducer, the air acts on the ferrous compound in the and precipitates it as basic ferric phosphate combined with the lime the organic matter.

Lime is indispensable for the formation of the "casse", for if it is preci- ed wholly or in part, the change does not occur on exposure to air; white wines always contain sufficient lime for its occurrence.

Iron and excess phosphoric acid are also indispensable, for the change occur in a healthy white wine on adding small amounts of ferrous ate and ammonium phosphate, and then causing oxidation by passing hrough or ad ing oxygenated water.

The use of sulphurous solutions of ammonium phosphate, now used place potassium metabisulphite in wine making, appears to be one of ost important causes of the change, which occurs especially in making e wines, the necessary material putting the musts in contact with a mass of iron.

The writer is carrying out more detailed researches on the subject.

On the Use of Paraffin Oil as a Substitute for Olive Oil in Sealing Wine Flasks. — EMALDI, STEO, in *Bollettino dei Ministeri per l'Agricoltura e per l'Industria, il Commercio l Lavoro*, Year XV, Vol. II, Series B, Part 5-8, pp. 47-49. Rome, May-August, 1917.

In previous communications, the writer has shown that the "yel- araffin oil" known in commerce as oenolium, oenoline, oenophylaxine, e. *paraffinum liquidum* etc., is made of paraffin oil coloured yellow by oline (09), and that it is used commercially for covering wine in the 2 litre straw covered, Italian flasks, for oiling Parmesan cheese g maturation, and for adulterating olive oil. During further researches riter has found that the yellow paraffin oil gives up its tropeoline to ine it is used to "seal". Thus the wine shows, on analysis, the pre- of artificial colouring matter, causing liability to fines and confisca- even if the wine were originally pure. Therefore it is advised to ntinue using yellow paraffin oil as a substitute for olive oil in sealing lasks.

ugar Sorghum and Alcohol in War Time, in France. — POUZIN, PAUL in *Journal riculture pratique*, Year 81, New Series, Vol. 30, No. 4, pp. 67-68. Paris, February 22, 7.

fter a general consideration of the sugar sorghum (*Sorghum saccha-*), the writer recalls the fact that the plant was fairly widely cultivat- France for the saccharose it contains. At first it was thought that gar sorghum would become the sugar cane of the south of France, and

plant has even been installed for making sugar. Unfortunately, in the sugar sorghum, on the contrary to the sugar cane, the proportion of glucose reaches and even surpasses half of the total fermentable sugar. The projects were thus checked.

The same fact was found some years ago in America, when it was attempted to use maize grown in a particular way (removal of the ear) for the same purpose

But if sugar sorghum is unsuitable for the production of saccharose, it can be very well grown for the production of alcohol ; it is quite possible that part of the alcohol imported from the United States by France originates from sugar sorghum which is largely grown for silage. The writer states that milling with an ordinary mill gives 60 per cent. of juice, which contains 10 to 16 per cent of sugar. The yield in alcohol might easily be 5 per cent of the weight of the stems, say 179 gals. per acre, for a crop of 15 tons which, as a crop for industrial purposes, may often be obtained. The cost of sugar sorghum being lower than that of sugar-beet its yield in alcohol is comparable to that of the latter.

The growth of sugar sorghum does not injure that of the sugar-beet, as it can be carried out in regions where, through lack of experience, labour or suitable soil, the latter can not be grown. In any case sugar sorghum would save a certain amount of sugar-beets for the distillery instead of their going to the refinery.

Measures should be adopted for supplying sufficient seed to the parties interested.

It should be noted that the sorghum-sugar can be treated in the existing distilleries ; the writer believes that cane mills can still be found in France that were erected for extracting the juice of the sugar sorghum.

370 – **The Development of the Brewing Industry in the United States during the last 25 years.** — RACH C., in *The American Brewer*, Vol. 4, No. 1, pp. 20-23, New York 1911.

The introduction and improvement of ice and refrigerating machines laid a new foundation for the brewing industry in the eighties of last century, for, by making it independent of the season of the year, it rendered unnecessary the construction of costly ice cellars, and thus prepared the way for the present large scale production.

In the last 25 years, the agricultural activity of the United States has increased enormously, thus assuring an abundant supply of all brewing materials — barley, wheat, maize, rice and hops.

The constant increase of consumers, owing to the strong influx of immigration, has caused the brewing industry to be in splendid condition and great development, as under these favourable conditions, capital was attracted.

The 20 to 30 per cent dividends paid by the consumers' breweries gradually decreased, and finally disappeared about 1898. From 1890 to 1900, the beer-production in the United States increased from 27 to 40 million of barrels, and from 40 to 60 millions of barrels during the years 1900 to 1910. Into this decade falls the enormous development

he bottle beer business, led by the large breweries of the West, which ther augmented the competition between Eastern, Western and local weries. The annual beer-production advanced steadily during the years 1 to 1914, and in 1914 reached its maximum of 66 189 473 barrels. alling-off of six million barrels took place in 1915, but this was partly vered in 1916.

In 1913-1914, the year showing the highest figures for the United tes, the comparative data of the 3 countries having the largest brewing rests was:

	Production	Population	Daily consumption per head
United States	66 189 473 barrels	91 972 266	0.24 litres
Germany	54 807 530 "	64 925 993	0.28 "
Great Britain.	50 590 170 "	45 221 615	0.37 "

In 1914, 13 of the 47 States of the Union produced 87.3 per cent of total amount; of these, the State of New York produced 21 per cent, nsylvania 12 per cent, Illinois 10.5 per cent, Ohio and Wisconsin each er cent. and Missouri 6.4 per cent.

In 1916, there were 1328 breweries existing in the United States. Of se, 307 had their own malt-plant, and 1 006 had their own bottling artment; 10 new breweries were established. The statistics show t:

1) The number of breweries decreased constantly till 1915; from 7 in 1801, it fell gradually to 1287 in 1914, and then rose to 1318 in 6; the production, however, is steadily increasing.

2) The number of breweries operating their own malting plant is oming smaller. In 1891, 36 per cent, and in 1916 only 23 per cent of breweries made their own malt. Only in the States of Wisconsin and nesota, where there is good barley production, do the brewers adhere re to the old process of making their own malt. "Commercial" malt ining ground on account of the introduction of the pneumatic process.

3) The number of breweries that bottle their own beer increased n 34 per cent in 1891 to 80 per cent in 1915. This development has ome of fundamental importance to the American brewing industry. It ures production on a large scale and stimulates the brewing of highly ented, stable beers that will stand shipping. Bottle beers are more ous and contain less extract than draught beers.

For this reason, the writer questions whether these new conditions satisfactory, and whether it should not rather be taken into account beer-brewing is a branch of agriculture and has assumed the task of ging the cereals to the consumers in the form of a good, wholesome erage — a food for the people.

371 - **New Considerations on the Examination of Milk.** — GERÖ WILHELM in *Zeitschr für Untersuchung der Nahrungs und Genussmittel, sowie der Gebrauchsgegenstände*, Vol. 3 No. 12, pp. 572-576. Münster. i. W. Dec. 15, 1916.

I. RELATION BETWEEN REFRACTION AND DENSITY. — For the examination of the milk from the point of view of "watering", ACKERMAN serum refraction method with calcium chloride certainly deserves closest attention. After several years of research the writer has b able to establish the fact that the refractive index of cow's milk rar drops below 38. There is a certain relationship between the specific grav and the refractivity of the watered milk. By subtracting from the degre refractivity (R) the density expressed in degrees of the lactodensimeter (a practically constant number is obtained, usually varying between 9 a 10. By means of this difference (R—L), approximate determination may made, when the density reading is taken, of the quantity of water added the milk. For instance, if R—L=5, the milk has been watered to the ext of 20 %.

By means of the average difference R — L = 10, the density of t curd may be approximately calculated from the refraction of the seru

The writer has observed in milk from the neighbourhood of Temes (Hungary), that the refraction of watered milk after curdling is only to 0.6 higher than that of normal milk. Thus if 0.5 be subtracted from t refraction (R) of the watered milk and if the refraction figure so obtain be diminished by 10 units, one obtains practically the density of the or nal milk.

II. — QUALITY OF THE MILK ACCORDING TO ITS WHEY CONTENT. The fact that watered milk gave much more whey than normal milk, s gested to the writer the idea of judging the quality of the milk accordi to the quantity of whey. Experiments along these lines showed that t quantity of whey furnished by 100 cc. of normal milk usually varies betw and 68 cc. If the quantity of whey exceeds 68 cc., it may be conclu that the milk has been watered. But, it is already known that where quantity of whey exceeds 70 cc. it is possible to determine, from the ot values of the milk, the quantity of water added, and it may be questio whether it is really necessary to determine the quantity of whey. Acc ing to the writer this determination can only be of value w the milk of a single cow is concerned, as the refraction may vary from normal according to circumstances. In this case the question is whet the milk of one and the same cow can or cannot contain a quantity whey reaching 68-70 cc. The writer has examined a number of sample milk obtained in the stable, especially from high yielding animals; so he has been unable to observe a single case where the above mentio figure has been reached.

III. — ESTIMATION OF THE QUALITY OF THE MILK FROM THE DEG OF ACIDITY. — The writer has long observed that the degree of aci

determined according to THÖRNER (1) is much lower in watered milk than in pure milk. In drinking milk which he has analysed the acidity varied between 17 and 22; in watered milk it dropped below 15 if the quantity of milk added is small and even below 11-13 if the quantity of water is greater. It should be noted that these figures only apply to samples of milk taken and analysed in the morning.

Taking the degree of acidity as a basis, samples of suspected milk may easily be recognised as follows: To a mixture of 10 cc. of milk + 20 cc. distilled H_2O are added 1.5 cc. of N/10 caustic soda coloured with phenolphtalein (1.5 cc. correspond to 15 degrees of acidity); the normal milk decolorises the base because its degree of acidity exceeds 15, whereas watered milk does not do so.

Finally, the writer considers that the refraction, degree of acidity and quantity of whey form a good means of judging the milk of a particular cow and often render the taking of stable samples superfluous.

72 - **General Data on Cheeses Manufactured at the Lodi Royal Experimental Station (Italy) during the Year 1915-1916.** — BESANA C., in *Annuario della R. Stazione Sperimentale di Caseificio di Lodi*, pp. 11-14. Lodi 1916.

During the period April 23, 1915 — April 23, 1916 the Royal Station or Experimental Cheesemaking at Lodi received 29 627 gallons of milk, equivalent to a daily average of 81.8 gallons of milk worked. The price of the milk varied from 7*d* to 7.18*d* per gall. delivered and measured at the station cheese depôt. The cheeses manufactured during the year include 4 whole milk kinds: "Stracchino Quartirolo", "Crescenza" "Gorgonzola" "Provolone", 4 kinds from partially skimmed milk: "Cacio cavallo", "Grana uso Reggiano" "Grana Lodigiano". "Gruyère uso Svizzero" (Swiss type Gruyère); 1 cheese from separated milk: Svedese (Swedish). The principal data relating to the yield of fresh and ripe cheese in cream' butter and skim-milk butter are collected in the adjoining table.

(1) A mixture of 10 cc. of milk + 20 cc. H_2O is titrated with decinormal caustic soda solution and the acidity determined expressed in terms of 100 cc. of milk.

Yields in cheese and butter obtained at the Lodi Station in 1915-1916.

	Whole milk cheeses				Cheeses from partially skimmed milk				Cheeses from separated milk
	Stracchino Quartirolo	Crescenza	Gorgonzola	Provolone	Cacio cavallo	Grana uso Reggiano	Grana Lodigiano	Gruyère Swiss type	Swedish
Number of cheeses	551	413	79	93	576	168	19	22	24
Average weight per cheese after 24 hours	5.07 lbs	4.81 lbs	25.97 lbs	5.51 lbs	4.52 lbs	46.91 lbs	62.17 lbs	50.71 lbs	26.72 lbs
Average weight per cheese after maturation	4.61 lbs	4.43 lbs	22.09 lbs	4.43 lbs	4.04 lbs	42.42 lbs	57.32 lbs	45.26 lbs	23.83 lbs
Average loss of weight after maturation	12,18	9,12	15,20	12,40	19,90	9,54	7,94	10,80	10,99
Average yield of fresh cheese as percentage of whole milk	15,62	17,50	14,10	10,30	8,27	6,42	6,30	7,63	5,36
Average yield of ripe cheese as percentage of whole milk	13,83	16,08	12,03	9,04	6,56	5,86	5,76	6,79	4,78
Average yield in skim milk butter as percentage of whole milk	0,23	0,20	0,22	0,55	0,33	—	—	0,50	—

3 - **The Drying of Cereal Grains in Germany.** — STETEFELD RICHARD in *Die Mühle* 53rd Jear, N° 45, pp. 739-740, 2 figs. Leipzig, Nov. 10, 1916.

The plant lately established in Germany for the drying of cereal ains is based on the principle of the circulation of the grain in a space

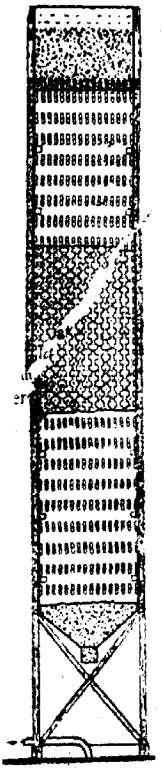


Fig. 1. — Vertical section showing air tubes traversing mass of grain.

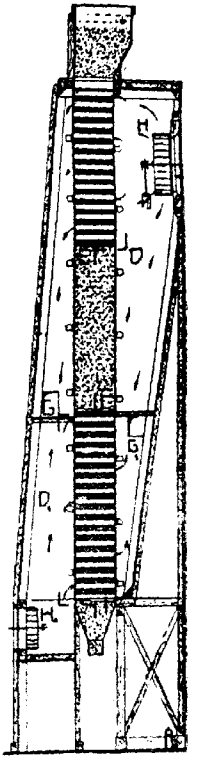


Fig. 2. — Vertical section showing access and circulation of air.

where it is dried by the air and blown or aspirated by means of pipes. There are 2 types of plant : 1) 1-story with hot air simply ; 2) 2-story with hot air at top and cool air at bottom : the air, however, which enters the drier is not cooled to at least + 3°C. as is necessary to obtain

an atmosphere not exceeding 14° C in temperature nor containing more 50 % moisture in order for the cereal to leave the drier with i water content. The vapour contained in the hot seed is under very pow tension, capable of causing, in unfavourable conditions, a violent expul of water from the grain. Hence the danger offered by the use of the u type of drier working at air temperatures reaching 60-70° C., and wh the warm grain passes abruptly to the ordinary temperature of the which is much lower.

The following should be the principle of a good grain-drier : one po tion of the plant, working at as high a temperature as possible, carries o the greater part of the drying while the other portion, which comes aft gradually cools the heated grain. The drier with subsequent refrigerat should work in such a way as to cool the grain to 14° C. removing from it fair amount of water so that it leaves the drier with 12 % of water.

The writer describes a drier with subsequent refrigerator which fulf the above conditions fairly satisfactorily. Fig. 1 shows a vertical secti with air tubes traversing the mass of grain, while fig. 2 shows the meth by which the air is conducted and made to circulate. The lower port serves for refrigeration : the air to be cooled enters at H_1 and leaves at I in the upper portion the warm air traverses the drier in the same man from H to G. The air currents may be made to act in inverse sense to direction given to the grain. In order not to overcrowd the figures heating and cooling apparatus has been omitted.

This drier has a yield of 10 tons per hour and requires 36 000 calo per ton if the grain is cooled from 40° C. to 14° C., losing 4 % of water. 6½ of steam from an engine are sufficient to furnish the requisite numb calories.

The writer gives the economic results from a drier with post refriger tion and continuous working, yielding 10 tons per hour and in conjunctic with a silo containing 30 compartments of 200 tons each. A drier of th type is capable of treating 200 tons of grain for 20 consecutive hours. Tl complete heating and refrigerating outfit requires the following capit outlay :

Drier with post refrigeration	20 000 *Marks* (1)
Refrigerating plant	40 000
150 H P Steam engine with generator	70 000
Total cost of installation	130 000 *Marks*
Building etc. for setting up plant	15 000
Grand total	145 000 *Marks*

(1) For the purpose of this article a *Mark* may be regarded as equivalent to a shilling (*Ed.*)

Working and Upkeep Expenses :

Fuel, water for refrigeration, oiling, cleaning, supervision	6 000 *Marks*.
Interest and depreciation on machinery, 12.5 % for whole year	16 250
Interest and depreciation on building at 6.5 % for whole year	975
Unforeseen expenses	1 775
Total working and upkeep expenses	25 000 *Marks*

To this sum for the first operation of drying and cooling the complete ot of grain, must be added an additional expense of 8 000 *Marks* in round gures for repeated refrigerations (say 5) during the hot months at a lower itial temperature (+ 20° C. for instance). The total expenses for a whole ear and a silo of 6 000 tons thus reach 33 000 *Marks*, or 5.5 *Marks* per on of grain.

74 - **Recent Data on the Potato Drying Industry in Austria.** — WIRTH in *Wiener Landwirtschaftliche Zeitung*, 67th Year, No. 8, pp. 51-55 ; No. 9, pp. 59-61. Vienna, 27th and 31st Jan. 1917.

Whereas in Germany the practice of drying potatoes had already acquired great importance before the war (1), it is only during the course of the present war that its value has been realised in Austria. At the present moment this country possesses 80 potato driers, of which 41 were set up, in 1916, in 2 new drying establishments. On the 7th. December the drying establishments affiliated to the "Kriegswirtschaftverband der Kartoffeltrocknunindustrie" were distributed as follows through the various regions Austria.

Potato Drying Establishments existing in Austria on 7th Dec. 1916.

Region	Total number of establishments	Number of driers for slices	for flakes	total
Bohemia	24	18	17	35
Moravia	12	15	8	23
Silesia	2	2	—	2
Lower Austria	3	9	2	11
Galicia	3	—	6	6
Other regions	—	—	—	—
Totals	44	44	33	77

(1) See B. 1916. No 1216. (*Ed.*)

Drying Establishments founded in 1916.

Region	Total number of establishments	Number of driers for slices	for flakes	total
Bohemia	12	12	6	18
Moravia	4	5	2	7
Silesia	2	2	—	2
Lower Austria	1	8	—	8
Galicia	3	—	6	6
Other regions	—	—	—	—
Totals	22	27	14	44

Besides the agricultural drying establishments, this table also includes industrial establishments. These latter deal with 80 % of the potatoes intended for drying, whereas the agricultural drying establishments only work 20 %.

375 - **Use of Flowers of Sulphur for Preserving Potatoes** (1). — *Bulletin de la Société des Agriculteurs de France*, Vol. LXXIX, pp. 10-11. Paris, January 1917.

The Director of the Agricultural Colony of Lamotte-Beuvron, France has for a long time past obtained excellent results by dusting potatoes with sulphur in proportion as they are stored in the silo or cellar.

Reddish or pink potatoes lose a little of their colour but retain their germinating faculty and acquire no taste of sulphur. As a result of the heat produced at the beginning of heaping the sulphur becomes transformed into sulphurous anhydride which spreads throughout the silo or store and destroys the latent germs of rot, especially those at the surface of the tubers.

This method is used by the Director with equal success for the preservation of accumulated stocks.

376 - **New Process for Preserving Butter over Long Periods**. — PAUL T. in *Chemiker-Zeitung* Year 41, N° 10, pp. 74-75. Cöthen, Jan. 24, 1917.

The writer already showed some time ago the possibility of preserving butter from deterioration for long periods by proceeding in the following way: separating the fatty matter of the butter from the remaining buttermilk, keeping it in tightly closed recipients and reconverting into butter when required for consumption by treating it with fresh milk. He has now attempted to convert this possibility into practice and has carried out trials which, having given very satisfactory results, have led to the adoption of the following methods:

I. PREPARATION OF THE FATTY MATTER DEVOID OF MOISTURE. — The butter, within a recipient, is set to melt in a water bath at 40-45° C. and the melted mass then left to itself for a time. The liquefied fat is then

(1) See Bulletin 1915, No. 752. (*Ed.*)

canted into a warm, dry recipient, while exercising care not to carry off well the watery portion forming the bottom layer (which can be used for oking purposes). Some kitchen salt is dried in an open-fire stove, allowed cool somewhat and then mixed in the semi-warm state with the melted , at the rate of 60 grams per kilo of butter. This mixture, after frequent rrings, is left in a warm spot for 2 or 3 hours so as to become liquid. is then poured through a warm funnel into dark coloured bottles to thin 1 or 2 centimetres of the neck. These latter must be clean ,warm d thoroughly dry. The corks need not be necessarily sealed up but y must fit closely. The bottles are kept in a dry, cool and dark spot. this process the writer has obtained from 1 kg. of salted butter an erage of 760 grams of filtered fatty matter differing fairly considerably m the melted butter (" Schmelzbutter ") commonly prepared in rmany.

II. — PROCESS FOR RECONVERTING THE FATTY MATTER INTO BUTTER. The contents of a bottle of preserved fatty matter are put on one side melt in a water-bath at about 40° C., at the same time, in another bottle double the capacity, are heated 15 parts by weight of fresh milk ; 85 parts weight of melted fatty matter are then added and the whole continuously d vigorously shaken for 2 to 3 minutes. The mixture, a sort of emulsion, then poured in a thin stream into a large tub containing water mixed th ice kept in continual movement, on contact with which it should imme- tely solidify. After a certain time the solid mass is taken up in a cullender, ined and kneaded. The butter so obtained may be used immediately, it gains considerably in quality if left for 12 to 24 hours in ice-chest or and subsequently kneaded anew. For preparing salt butter, up to ms of salt may be added per kilo.

e product so obtained possesses the consistency, appearance and butter. It is necessary to pour the emulsion in a thin thread iced water and to keep this latter in constant motion in order to e formation of lumps With practice, a good quality butter can be Instead of fresh milk, sterilised or powdered milk may be to the detriment of the flavour, however. On the other hand, condensed milk is excluded.

— CONCLUSIONS. — In consequence more particularly of the dif- ising in the distribution of butter, the 2 processes described above e following advantages :

Perfect conservation of the fatty matter of the melted butter for onger, a point which affords a strong recommendation for the pro- when reconversion into butter is not contemplated.

No loss of the constituents of the butter.

Adaptability not only for use on a large scale but also for small families, with the object of accumulating and preserving for the the smallest quantities of butter manufactured in spring and

An opportunity for local authorites to accumulate large stocks of gradual distribution in small quantities and in handy form.

377 - **The Preservation of Fish by the Ottesen Freezing Process.** — See No. 354 of this *Bulletin*.

378 - **The Introduction of a Trade Mark for Butter Made in Iowa, United States.** — *Yearbook of Agriculture*. XVI. pp. 368 - 370. Dec. Moines, Iowa. July 1, 1916.

During the last Session of the Legislature, the dairy law was amended so as to permit the use of a trade mark for Iowa butter, the purpose of which was defined as " Insuring a higher standard of excellence and quality, a more uniform butter market, a higher market value for the butter manufactured in the State, and to insure a more healthful product for consumption at home and abroad ".

As a means of placing this trademark in effective operation, the law named an executive committee composed of the President of the Iowa State Dairy Association, the President of the Iowa State Buttermakers Association, the Dean of the Division of Agriculture of the Iowa State College, The Professor of Dairying of the same institution, and the State Dairy and Food Commissioner. The Executive Committee has devoted its attention to securing a copyright from the United States Bureau of Patents. The trademark guarantees the product sold as " First Quality Iowa Butter, (State Butter Control) ".

While there is probably more butter of this quality produced in Iowa than in any other State in the Union, even the best grades of Iowa butter often sell at a price below their real value, because the products of the various creameries are not of uniform quality and the purchaser has no means of differentiating between them. It is believed the trade mark will adjust this difficulty, for butter bearing this mark will be distinctive, and the mark significant of quality. Only those creameries will be entitled to the use of this trademark which produce butter of the same uniform good quality, and manufactured under rules and regulations necessitating a high standard of cleanliness. Further, the creameries must be periodically inspected by the State Dairy Inspectors. While the trademark was designed primarily as a means of promoting the sale and increasing the market of the wholesale package, the same mark could be used for prints packed for eastern shipment, or designed for sale on the Iowa market. The Executive Committee in charge of the trademark, whose work it is to complete the details for the plan, must have the hearty cooperation and assistance of the creamerymen of Iowa.

PLANT DISEASES

GENERAL INFORMATION.

- **Credits Allocated in 1916-17 for the Control of Diseases and Pests of Plants, in the United States.** — See *Bulletin* for March 1917, N. 211.

DISEASES NOT DUE TO PARASITES OR OF UNKNOWN ORIGIN.

- **A New Disease of Pelargoniums in Germany.** — LINGELSHEIM A., in *Zeitschrift für Pflanzenkrankheiten*, Year 26, Part. 6-7, pp. 375-378. Stuttgart, September 16, 1916.

The author observed that, for some years, one of his pelargoniums duced leaves with numerous light spots and fine, transparent lines. plant belonged to the variety having salmon pink flowers, and leaves uniform green without stripes. During the winter it was in a dry cel- and only in spring did it produce a restricted number of leaves thus de- med. The leaves grew for a certain time, then turned yellow, dried up fell. In 1916, a plant belonging to the same stripeless variety with t red flowers showed this change for the first time.

If the young closed leaf is examined against the light, minute, light, sparent spots may be observed whose number increases with the th of the leaf. These spots may be either isolated or grouped, some- s they join up altogether to form light lines. They are circular and times, though rarely, oval. The diameter of the spots varies greatly never exceeds ¼ mm.

If the light falls vertically on the leaf the transparent spots are seen small pustules on the under side. If many pustules join up they have appearance of a thin crust.

Transversal sections of tissues thus attacked examined under the mi- cope show the pustules to be due to an abnormal development of the ophyll cells. As the growth increases the chlorophyll disappears.

A superficial examination of the change leads to the conjecture that it question of TUBEUF'S " Weisspunktkrankheit der Blätter " (White spot

leaf disease) but the symptoms are not identical. Neither is it ZACHER's "Weissfleckigkeit" der Blätter (White patch leaf disease) SORAUER describes the formation on the leaves of the *Pelargonium zonale*, of white pustules similar to those of *Cystopus* in which there is an abundant formation of cork which rapidly tears the epiderm. This phenomen has never been observed in the case described, nor do the pustules ever grow to the size of those described by SORAUER. The disease called "sordago" (1) which attacks *Mirabilis Jalapa* is also identical with that described by the author.

DISEASES DUE TO FUNGI, BACTERIA AND OTHER LOWER PLANTS.

381 - **Observations on Plant Diseases carried out in 1915 at the Royal Institute of Cryptogamic Botany (Cryptogamic Laboratory) of Pavia, Italy.** — BRIOSI GIOVANNI, in *Bollettino dei Ministeri per l'Agricoltura e per l'Industria, il Commercio ed il Lavoro*, Series B, Year XV, Vol. II, Part. 5-8, pp. 17-26, Rome, 1916.

In 1915, as a result of the prolonged wet weather, *Plasmopara viticola* and *Puccinia graminis* which attack the vine and wheat respectively showed an extraordinary development. In certain Italian provinces the wheat suffered considerably also from *Cladosporium herbarum*, *Septoria graminum* and *S. glumarum*. Peach trees were seriously attacked by *Sphaerotheca pannosa* and *Clasterasporium carpophilum* which also attacked almond and apricot trees. Pear trees and apple trees suffered from *Fusicladium* and olive trees were subject to serious ravages from *Cycloconium oleaginum* and *Stictis panizzei*, especially in southern Italy and many of the central districts. Tomatoes and potatoes were violently attacked by *Phytophthora infestans*, and many potato plants also suffered from *Fusarium solani*. The following market vegetables were seriously damaged: - beans, attacked by *Sclerotinia libertiana*; celery, by *Septoria apii*; melons by *Fus. niveum* and *Colletotrichum oligochaetum*; French beans, by *Coll. lindemuthianum*. Large plantations of rose-trees, especially in the Ligurian district, were subjected to depredations by *Sphaerotheca pannosa* and *Botrytis vulgaris*.

The author, who aims at spreading a knowledge of plant pathology amongst agriculturists, gives in this report concise information with regard to many diseases of wheat due to vegetable parasites, such as *Micrococcus tritici*, *Gibberella saubinetii*, *Septoria glumarum*, *Gibellina cerealis*, *Ophiobolus graminis*, *O. herpotrichus*, *Leptosphaeria herpotrichoides*, *Sphaerodermadamnosum*, *Dilophia graminis*, *Erysiphe graminis*, *Cladosporium herbarum*, *Sclerospora macrospora*, *Septoria graminum*, and *S. Tritici*.

A detailed list follows of 1932 samples examined by the Institute in 1915 and an account of the scientific investigations carried out in the same year and of the publications of the Staff is included.

(1) See B., June, 1916, No. 686. (*Ed.*).

82 - **Peronosporaceae observed in Tuscany, Italy.** — SAVELLI; MARTINO, in *Bollettino della Società botanica italiana*, No. 1, pp. 13-19. Florence, 1917.

1) *Cystopus candidus* (Pers.) Lév., on *Capsella Bursa-pastoris*, and on the leaves of *Thlaspi perfoliatum*, *Barbarea vulgaris*, *Hesperis matronalis*, *Cardamine chelidonia* and *Brassica oleracea* in the province of Florence; on the leaves of *Capparis inermis*, *Capsella Bursa pastoris*, *Nasturtium sylvestre*, *Cakile maritima* f. *latifolia* in the province of Pisa; on the stems and flowers of *Capsella gracilis* in the province of Arezzo; on *Diplotaxus* sp., in the province of Grosseto.

2) *C. portulacae* (D. C.) Lév. on the leaves and stems of *Portulaca oleracea* in the provinces of Florence and Pisa; also found in the provinces of Siena and Grosseto;

3) *C. Bliti* (Biv.) De By., on the leaves of *Amaranthus patulus*, in the province of Florence;

4) *C. Tragopogonis* (Pers). Schröt., on the leaves of *Tragopogon* sp., in the province of Florence; on *Inula salicina* in the province of Siena;

5) *Phytophthora cactorum* (Colm and Lebert) Schröt., on the leaves of *Fagus sylvatica* in the province of Florence;

6) *Phyt. infestans* (Mont.) De By., on *Solanum Lycopersicum* and *S. tuberosum*, in the province of Lucca; on *S. tuberosum* in the provinces of Florence and Pisa;

7) *Plasmopara pygmaea* (Unger) Schröt., on *Anemone nemorosa*, in the province of Florence.

8) *Pl. pusilla* (De By) Schröt., on *Geranium nodosum*, in the province of Florence;

9) *Pl. densa* (Rab.) Schröt, on the leaves of *Rhinanthus Cristagalli* in the province of Florence;

10) *Pl. viticola* (Berk. and Curt) Berl. and De Toni, on the vine, very widespread in all the provinces;

11) *Pl. nivea* (Unger) Schröt., on *Aegopodium podagraria*, in the provinces of Florence and Pisa;

12) *Pseudoperonospora cubensis* (B. and C.) Rostow, on *Cucumis Melo* in the province of Florence, where it was found only once, in 1906;

13) *Bremia lactucae* Regel, on *Lactuca sativa*, *Lapsana communis*, *Sonchus oleaceaus* and *Senecio vulgaris*, in the province of Pisa;

14) *Peronospora calotheca* De By, in Rab. on the leaves of *Asperula odorata* in the province of Florence;

15) *Per. alsinearum* Casp., on the leaves of *Cerastium glomeratum*, *C. arvense* and *Stellaria media* f. *gymnocalyx*, in the province of Florence; on *Stell. media* f. *trichocalyx* in the province of Pisa;

16) *Per. grisea* (Ung.) De By., on *Veronica serpyllifolia*, in the province of Florence;

17) *Per. arborescens* (Berk) De By., on *Papaver dubium* in the province of Florence; on *P. somniferum* in the province of Pisa; on *P. Rhoeas* in the province of Siena;

18) *Per. effusa* (Grev.) Rab., on the leaves of *Chenopodium murale*, in the province of Florence;

19) *Per. Viciae* De By., on *Vicia sepium*, in the province of Florence on *V. sativa*, in the province of Siena;

20) *Per. Ficariae* Tul., on *Ranunculus bulbosus* in the province of Florence;

21) *Per. Urticae* (Lib.) De By., on *Urtica urens*, in the province of Pisa;

22) *Per. alta* Fuck., on *Plantago major*, in the province of Florence;

23) *Per. parasitica* (Pers.) De By., on *Matthiola* sp., in the province of Florence, on *Chieranthus Cheiri*, in the province of Pisa;

24) *Per. affinis* Rosm., in Rab., on *Fumaria officinalis* in the province of Florence.

383 - **Change of Host of the Uredinaceae *Thecopsora sparsa* and *Pucciniastrum Circaeae*.** — FISCHER ED., in the *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 46, Nos. 11-16, pp. 333-334. Jena, September 2, 1916.

Infection investigations carried out by the author in the spring of 1916 with *Thecopsora sparsa* (Wint.) P. Magn. and *Pucciniastrum circaeae* (Schum.) Speg. lead to the discovery in these two uredinaceae of aecia hitherto unknown.

1. — Teleutospores of *Thecopsora sparsa* which had been collected from *Arctostaphylos alpina* were placed on the 3rd. May 1916, on the new young shoots of small potted plants of *Abies pectinata*, *Picea excelsa*, *Larix decidua* and on a few female flowers of a *P. excelsa* which was growing in the field. The young shoots of the silver fir were almost completely open, but the axes of the spruce were not entirely free, so that the needles were still bunched. On the 17th May, for the first time, there were signs of the presence of pycnidia (spermagonia) and, on the 19th May, aecidia were observed. A second series of experiments commenced on the 18th May confirmed this result. No aecidia were located on the cones.

The aecidia are very similar to those of the other species of *Thecopsora* and *Pucciniastrum*, and to those of *Chrysomyxa*. The colour of the young needles on which they first appear is hardly changed. The pseudoperidium is hollow, cylindrical or slightly flattened and usually opens at the top rather as a lid. The aecidiospores assume an orange shade.

2. — KLEBAHN had already carried out infection experiments by means of teleutospores of *Pucciniastrum circaeae* on *A. pectinata*, *P. excelsa*, *L. decidua* and *Pinus sylvestris*, but had obtained no positive result. Having collected a large number of teleutospores in the neighbourhood of Berne in the autumn of 1915, the author started similar experiments. On the 12th May, 1916, he placed leaves of *Circaea lutetiana* bearing teleutospores on young shoots of small potted plants of *A. pectinata*, *P. excelsa*, and *L. europea*. On the 29th. May numerous pycnidia were removed from the needles of an *A. pectinata*. As in the case of *Thecopsora sparsa* these were found on the epidermis and appear as small white spots underneath the cuticle. On the 2nd. June, young aecidia were observed on the same shoot. Another closer examination showed the presence of aecidia on the other experimental silver firs, though in this case they were less numerous. As in the case of *Pucciniastrum abietis-Chamaenerii*, the aecidia are cylindri

ins with a hollow, soft pseudoperidium. They appear in two rows the underside of the needles and are rarely met with on the upper side. aecidiospores are of a light yellow colour merging into pale orange. A detailed description of the aecidia of the fungi will be published r.

- **Types of Sunflower Resistant to Diseases and Pests, in Russia.** — See No. 321 of this *Bulletin*.

- **Patents Relating to the Control of Diseases and Pests of Plants.** — See *Bulletin* of March 1917, No. 275, and April, 1917, No. 364.

- ***Puccinia caucasica* n. sp., a Parasite of *Iris flavescens* in the Caucasus.** — SAVELLI MARTINO, in the *Bollettino della Società botanica italiana*, No. 1, pp. 11-13. Florence, 1917.

Under the name of *Puccinia caucasica* a new species of Uredinaceae nd in 1909 in the Caucasus (near Zurnobad, province of Elisabethzols) Dr. SCHELKORONINOW on *Iris flavescens* is described. On the leaves the host the parasite forms large stromalike patches which are more less round or oval. These patches may be clearly seen both on the er and under sides of the leaf.

- **New Observations on the "Ink Disease" of the Chestnut Tree in Italy** (1). — PETRI L., in *Rendiconti delle sedute della Reale Accademia dei Lincei*, classe di Scienze fisiche, matematiche e naturali, 5th. series, 2nd Half-year, 1916, Vol. XXV, Part 5, pp. 172-176, ig. 1-2; Part 12, pp. 499 - 501, fig. 1-2. Rome, 1916.

I. — The results of his previous studies on the etiology of "ink disease" d the author to believe there existed a rotting of the heart and sap- od which, starting from the collar, both descended towards the base of root system and mounted the trunk.

Later investigations have shown that this change of the fibre in ntrifugal sense, is the immediate result of the infection of the cambium a parasitic mycelium, which spreads rapidly in a longitudinal direction, l more slowly in a transversal direction. It is this mycelium which rmines the simultaneous diseased condition of the bark and sapwood causes the formation of conical, brown rings which, having their e near the collar, mount to a greater or lesser height on the trunk. ilar brown rings are also found on the main roots, but in this case, they aden towards the base of the root. In conjunction with these rings the ik stains" appear on the ouside of the tree. These rings are not a con- nation of those caused by *Coryneum perniciosum* Br. and Farn., and y converge when the plant is completely dried up.

The mycelium consists of large nonseptate hyphae, which usually mul- ly in a longitudinal sense and enter the walls of the cambium-cells, ding out here and there a small number of short lateral ramifications. attempts to isolate this mycelium and to grow cultures of it have ed.

(1) See also *B.* Nov. 1915, No. 1211. (*Ed.*)

This mycelium cannot be identical with the mycelium of *Coryneum* for the following reasons: — 1) Their morphological characteristics are not identical; 2) it remains in the cambium for a long period and does not invade immediately the bark and sapwood as *Coryneum* does with great rapidity 3) ordinary cultural methods fail, whereas *Coryneum* grows easily on almost any media, 4) after the cambium cells have been killed by the mycelium in question, the hyphae also die and, up to the present, no formation of spores or other organs of perpetuation have been observed.

It may be assumed that, after having lived at the expense of the cambium, the mycelium assures reproduction by the passage of hyphae into the bark when this has not yet been invaded by saprophytes. This would explain the relatively slow diffusion of the disease, for conditions favourable to the formation of sporogenous organs are not easily produced. It would also explain the difficulty of determining the real pathogenic agent causing " ink disease ".

II. A later note (pp. 499-501) confirms the assumption that the primary infection which leads to the changes characteristic of " ink disease" is caused by the presence of a parasitic mycelium in the cambium of the base of the trunk and main roots of the chestnut tree attacked.

The site of the primary infection and the mode by which it is effected have been specially studied in this paper. Investigations carried out in 1916 show that the primary infection is produced round the base of the main roots, and that the mycelium penetrates their cortical parenchyma though the fine peridermic layer which protects the living cortex at the heart of the fissures of the rhytidoma.

If a tangential section is made of a root which has been recently attacked on the level with an " ink stain ", a dark mark surrounded by a brown line stands out clearly on the yellowish white of the healthy cortical parenchyma. The depth of this stain in the parenchyma is in proportion to the duration of infection. The cambium is finally attacked. The mycelium grows with great rapidity in this tissue especially in a longitudinal direction, spreading preferably towards the collar and from this towards the base of the trunk on the level of the soil.

There are two categories of " ink-stains " on the roots. Those which have just been described, and which are called by the author " primary stains " appear on healthy roots whose sapwood and heartwood are quite normal. They are due to direct infecion by the parasitic mycelium which by causing necrosis of many of the cells of the cortex, also causes the oxidation of the tannin contained therein.

The second category, called by the author, " secondary stains " is caused by the formation of brown patches which do not differ chemically from the " primary stains ". They are formed by a change in the cortex which results from the dying off of the cambium, depending on the rotting process which extends from the heartwood to the sapwood.

This change often occurs in chestnut trees whose collar has already been attacked by the specific parasite. This is a case of rotting due to various species of fungi which vary according to district and, in some cases

cording to the plant. The necrosis of certain parts of the cortex is hast-ned by the action of saprophytic mycelia which facilitate the rapid idation of the tannin. This oxidation, which is the cause of the brown loration, may be produced in the absence of microorganisms simply by ie action of the oxygen of the air. There are, however, fungi which cause rown coloration of the tannin of the cortex even *in vitro*. Recent patches n the cortex do not increase in size when the roots are placed in damp il or in sand.

The parasitic mycelium dies quickly as soon as the condition of the ssues attacked leads to a rapid decrease of their vital activity. Careful ıvestigations have shown that the parasitic mycelium is killed by the an-agonistic action of other microorganisms, which develop in the tissue which has already destroyed.

WEEDS AND PARASITIC FLOWERING PLANTS.

384 - ***Sida acuta*, a Weed of Queensland, Australia** (1). — BAILEY J. F., and WHITE C. T., in *Queensland Agricultural Journal*. Vol. VI, Part 4, p. 262. Pl. 34, Brisbane 1916.

It is somewhat difficult to say whether *Sida acuta* Burm. is a native *Malvacea* of Queensland or whether it has been introduced into that country. It is a widely-spread weed of tropical countries, and in its great similarity to *Sida rhombifolia* L., (more commonly known as *Sida retusa*) may have been passed over by general collectors in Queensland.

During the past years, specimens have been received from various northern localities. Mr. E. JARVIS of Gordonvale near Cairns, says that *Sida acuta* is a great pest and the commonest species of *Sida* in that neighbourhood. In a recent visit to Townsville, the writers noticed that *Sida acuta* and *S. Cordifolia L.* were two of the commonest weeds of the district, and that *S. acuta* was much more prevalent than *S. rhombifolia*.

Although it is a noxious weed, *S. acuta* has some economic uses. The natives make brooms of this and allied species. In the Philippines, and in India, the leaves and roots are used for medicinal purposes.

The best means of controlling this weed, in small areas, is hand-pulling or cutting off below the surface of the soil, while in larger areas where the plants are growing thickly, spraying with any of the commercial weed-killing preparations should be successful. The plants should be dealt with prior to seeding.

389 - ***Sonchus oleraceus* and *Hypochoeris radicata*, Weeds of New South Wales** (2). — MAIDEN, J. H., in *The Agricultural Gazette of New South Wales*, Vol. XXVIII, Part 1, pp. 46-48. 2 Coloured Plates. Sydney, Jan. 2, 1916.

A description of two *Compositae*, *Sonchus oleraceus* L. (Sow thistle) and *Hypochœris radicata* L. (Cat's ear or Flat-weed).

(1) See also *B.* February 1917, No. 204. (*Ed.*).
(2) See also *B.* Oct. 1916, No. 1136. (*Ed.*).

The former of these two plants is regarded by the writer as having been introduced into Australia. The only method of controlling the weed is to pull it up before it matures its seeds, as these are carried long distances by the wind.

H. radicata has now spread into every Australian State, and can only be got rid of by means of the hoe, or some other cutting implement, which is of course, only practicable where the cost of labour is relatively unimportant. It is of advantage to cut down the inflorescences, but like the sow thistle, this weed seeds itself and spreads with great rapidity.

390 – **The Means for Controlling *Cirsium arvense* (= *Cnicus arvensis*).** – See No. 313 of this *Bulletin*.

INJURIOUS INSECTS AND OTHER LOWER ANIMALS.

391 – **Chalcididae of the Wild Fig-Tree in India, Ceylon and Java.** — GRANDI, G., in *Bollettino del Laboratorio di Zoologia generale e agraria della R. Scuola superiore d'Agricoltura in Portici*. Vol. XI, pp. 183-234, fig. I-XX; and Vol. XII, pp. 3-60, fig. I-XXII, Portici, 1917.

A systematic description of the folowing hymenoptera is given:

a) In India: 1) *Ceratosolen gravelyi* Grandi, in the fruit of *Ficus Cunia*;

2) *Eupristina saundersi* n. sp., in the fruit of *F. religiosa* and of *F. retusa* var. *nitida*;

b) In Ceylon: 1) *Blastophaga gestroi* Grandi: fig host unknown; 2) *Ceratosolen fuscipes* Mayr., in the fruit of *F. glomerata*; 3) *Eupristina grassii* n. sp., fig host unknown; 4) *Sycophaga brevitarsus* Grandi: fig host unknown; 5) *Apocrypta westwoodi* Grandi, in the fruit of *F. glomerata*;

c) In Java: 1) *Blastophaga? puncticeps* Mayr, in the fruit of *F. fulva* 2) *B. puncticeps distinguenda* Grandi; fig host unknown; 3) *B. boldingi* Grandi, in the fruit of *F. lanata*; 4) *B. valentinae* Grandi, in the fruit of *F. cuspidata*; 5) *B. jacobsoni* Grandi, in the fruit of *F. procera* var. *crassiramea*; 6) *Ceratosolen striatus* Mayr., in the fruit of *F. variegata*; 7) *C. striatus notandus* Grandi, in the fruit of *F. variegata*; 8) *C. crassitarsus* Mayr in the fruit of *F. ribes*; 9) *Eupristina emeryi* Grandi, fig host unknown 10) *E. koningsbergeri* Grandi, in the fruit of *F. Beniamina* var. *comosa* 11) *Sycophaga spinitarsus* Mayr, in the fruit of *F. variegata*; 12) *S. tristis* Grandi, in the fruit of *F. glomerata*.

392 – **New Species of Coccid-Infesting Chalcids on the Gold Coast and in Southern Nigeria (Africa).** — WATERSTON JAMES, in *Bulletin of Entomological Research*. Vol. Part 3, pp. 231-257, Fig. 1-9. London, 1917.

A systematic description of:

1) *Aneristus croconotus* sp. nov. obtained from *Lecanium* sp. on orange and *Tephrosia vogelii* at Aburi (Gold Coast).

2) *Coccidoxenus coelops* sp., nov. bred from *Ceroplastes vuilleti*, Marchal, Southern Nigeria.

3) *Cocc. obscuratus*, sp. nov. bred from *Lecanium somereni* Newst, at Aburi.

4) *Chiloneurus afer*, sp. nov. obtained from *Pulvinaria jacksoni* Newst., at Aburi.

5) *Chil. cyanotus*, sp., nov. from *Lecanium* sp. on *Tephrosia vogelii* at Aburi.

6) *Cerapterocerus* (*Eusemion*) *pattersoni*, sp. nov., from *Vinsonia perornata* Newst., at Aburi.

7) *Eunotus truncatipennis*, sp. nov. from *Lecanium* (?) *somereni*, Newst., on Kola, at Aburi.

93 - **Wolfiella ruforum n. gen. and n. sp., a Chalcid Parasite of the Eggs of *Lophyrus rufus* in Germany.** — KRAUSSE ANTON, in *Zeitschrift für Forst und Jagdwesen*, Year 49, Part 1, pp. 26-35. Berlin, January, 1917.

In 1915, Professor MAX WOLFF collected a large number of pine branches on the needles of which were a large number of eggs of *L. Rufus*. The branches were placed by the author partly in breeding cages, partly in a covered petri dish and partly in a wooden box. During the winter the cages and petri dish were kept in a warm laboratory ; the wooden box was kept near a window in an unheated room. The eggs kept thus hibernated well.

On the 5th March 1916, the first chalcid was noticed in the petri dish. The following day two other chalcids were seen in the breeding cages and on the 7th March chalcids appeared in the wooden box. The difference in temperature had, therefore, not had any influence on the development of the insect. Up till the 5th April new chalcids, all females, continued to appear. As there were no other eggs on the pine-needles there can be no doubt that these chalcids emerged from the eggs of *L. rufus*. On 10 needles chosen at random 44 holes were counted though which the chalcids had left the eggs.

This chalcid, which is very small, forms a new genus and has been named by the author *Wolffiella ruforum*.

94 - **The Solubility of the Scale of the Mussel Scale-Insect (*Lepidosaphes Ulmi*, Linn.).** — MAULIK S., in *Bulletin of Entomological Research*, Vol. 7, Part 3, pp. 267-269, Fig. 1. London, 1917.

This short communication states the result of an enquiry into the solubility of the incrustation of the mussel scale-insect, *Lepidosaphes Ulmi*, Linn., (*Mytilaspis pomorum*, Bché) which is destructive to the bark of various cultivated trees, particularly the apple tree. The control of this insect by means of insecticides to a large extent depends upon getting access to the insect by dissolving the scale with which it covers itself soon after it settles down on the bark for the rest of its life. Whatever may be the development of the insect, unless the scale can be dissolved, at least at its point of contact with bark, no great result can be expected from the application of insecticides.

It is generally believed that the incrustation is of a waxy nature. The

writer therefore used various reagents (petroleum ether, benzene, alcohol, xylol, chloroform, acetone, toluene, methyl alcohol, carbon bisulphide, methylated ether, carbon tetrachloride, petroleum, terpineol, clove oil, ethyl acetate, pyridine and soap solution) to see if a suitable solvent could be found.

For these tests the scales, after having been obtained in a sufficient degree of purity, were placed in test tubes and kept in the above mentioned reagents for nearly a year, but no action seems to have taken place; at any rate, the scales were not dissolved.

The writer found that the scales were also not dissolved by concentrated sulphuric acid, nor by sodium carbonate, even if heated. The scales are hygroscopic, losing 8 or 9 per cent in weight when heated in a water bath; they contain about 4.5 per cent of nitrogen; they dissolve in a normal solution of caustic soda, or potash.

Although caustic alkali dissolves the scale in the test tube, its application as a spraying fluid is not quite successful, as has been ascertained by experiments made by the writer in an orchard. He applied caustic potash solutions in various strengths to the trees, but did not succeed in entirely preventing the insects from hatching out. Besides, the application of caustic alkali is beset with mechanical difficulties and causes much inconvenience to the operators.

The treatment in vogue at the present day consists in using spraying fluids compunded of caustic soda, lime, paraffin, iron sulphate and copper sulphate. Treating the scale in the test-tube with the above reagents separately, as well as in their combinations forming the washes, it is found that, with the exception of caustic soda, they have no solvent action. It is on record that these washes have been found useful to a certain extent. This may be attributed to the purely physical action of the paraffin owing to its low surface tension. This property enables the oil to penetrate minute cracks and crevices thus wetting the surface well. Insects hatching out, coming into contact with the oil, are killed. The paraffin may also get access to the eggs by penetrating under the scale where its contact with the bark has been loosened by weather conditions. If in this way the eggs under the scale become thoroughly soaked with the oil it is very improbable that they will hatch. On the other hand, the chance of the oil thoroughly wetting a whole batch of eggs under the scale are very remote, thus we find that even after a good spray, a large percentage of insects hatch out.

It is a generally accepted view that contact insecticides kill insects by acting detrimentally on the respiratory system. In this insect, the spiracles, the orifices through which the insecticides must act, are in two pairs and are situated on the ventral side, where, being more or less protected by the body of the insect, they run little risk of the spraying fluid reaching them.

The parasite confines itself mainly to the trunk, though it may spread a little way up the larger branches. Taking advantage of this fact scrubbing the trunk and the bases of the branches with a hard brush and a

water is an excellent remedy. This should be done in winter when the eggs are dormant, while any eggs that are left should be killed by spraying the trees in spring with a weak solution of paraffin emulsion.

95 - ***Tomaspis tristis*, a Rhynchote Attacking Sugar Cane in Surinam, South America** (1). — WILLIAMS C. B., in *Bulletin of Entomological Research*, Vol. 7, Part 3, pp. 271-272. London, 1917.

On June 10, 1916, the writer visited the Marienburg Estate, Surinam, s froghoppers [*Tomaspis tristis* F. (fam. *Cercopidae*)] had been reported s occurring in sufficient numbers to cause injury to the sugar cane.

The insect was found on two parts of the estate which had been heavily nfested the previous year, but not in sufficient numbers to do any damage. ks, however, the wet season was only beginning, it would probably increase apidly during the next few months.

The adults are much larger than the Trinidad species (*T. saccharina* Dist.) and were found sitting in the characteristic position, head upwards t the base of the leaves of the cane.

At the time of collecting (mid-day) they were sluggish and easily captured with the fingers; 11 females were caught and only 4 males.

Eggs were not found in the wild state, but some were obtained from males in captivity which were given the choice of green leaves and moist ead plant remains. The eggs were without exception laid in the latter, s a rule, they were embedded in the material but in many cases they were serted more deeply than is usual in the case of *T. saccharina*. Several ggs were laid in a dead, rolled-up leaf. Seven females (of which one was reshly emerged and probably did not lay) laid over 60 eggs in the course f 24 hours.

The nymphs, surrounded by their froth, were usually found under the af-sheaths of the cane, either near the ground or some 3 to 4ft. above it. he was found in the rolled-up leaves at the top of the cane. The writer id not have an opportunity of examining the roots below ground, but e was assured that no nymphs had ever been seen on the roots. This s an important difference in habit from both the Trinidad froghopper *T. saccharina* and the Demerara species (*T. flavilatera* Urich.).

The froth made by *T. tristis* is of the loose soft type similar to that of *T. saccharina* and unlike the stiff close froth made by *T. pubescens* F. one pecimen of which was obtained by the writer from grass alongside one of he cane-fields.

In all, 71 nymphs of the froghopper were collected in different tages of development.

During the short time the writer was in the field, he observed no atural enemis of *T. tristis*.

This froghopper appears to be a possible serious pest of sugar-cane, ut owing to its habit of attacking the plant above ground, it will not, in he writer's opinion, ever be so serious as the Trinidad species (*T. saccha-*

(1) See *B.* June 1914, No. 589. (*Ed.*).

rina) for the stout stem is more able to withstand loss of sap than the roots. On the other hand, flooding the fields, as is done in Demerara for *T. flavilatera*, will have little or no effect on *T. tristis*.

Judging by the numbers the writer was able to pick in a very short time, organised hand-picking, particularly at the beginning of the wet season, would be worth while if the pest occurs in as large numbers as in 1915. The position of the nymphs above ground lends itself to control by spraying, if such a thing were considered possible. Light traps might also be tried on a small scale.

No trace of green muscardine fungus (*Metarrhizium Anisopliae*) was observed on any insects in the cane-field. If this natural enemy could be introduced, it might be very successful, in view of the short and comparatively moist dry seasons in this country.

There are specimens of this species in the museum at Georgetown which are labelled as having been collected in British Guiana, but this would need to be confirmed. The nearest related species in Trinidad is *T. guppyi*, Urich, an apparently rare species of which the habits are unknown.

INJURIOUS VERTEBRATES.

396 - **The Control of Field Voles in Italy.** — SPLENDORE, ALPONSO, in *Rendiconti della sedute della Reale Accademia dei Lincei, Classe di Scienze fisiche, matematiche e naturali*, Series 5, 2nd. Half year, 1916; Vol. XXV, Part 6, pp. 218-224, and Part 12, pp. 516-521. Rome, 1916.

I. — The mortality of these rodents which was observed in the "Contessa" district near Cerignola (1) developed to a great extent, and spread to different districts, to the provinces of Foggia, Bari and Potenza. It occured in regions where no poison had ever been used against this pest. A high mortality was also observed amongst the voles sent to the Laboratory of Agricultural Entomology of the University of Rome. These voles came from the neighbourhood of Capitanata (Foggia district), which, although a great distance from the "Contessa" district, is badly infested by these rodents. The dissemination of the voles in the "Contessa" and other districts is considered to be largely responsible for this increase in epizooty.

The infection causing the epidemic is of the character of septicaemia. The post mortem examination shows congestion of the internal organs, which are greatly enlarged and of a red-brown colour. This is particularly marked in the spleen and the liver. Death is caused by a bacterium which was found, not only in all the voles attacked by this spontaneous epidemic but in all those which died as a result of experimental infection from pathological matter or cultures.

(1) See *B.* September 1916, No. 1056. (*Ed.*).

The bacteria have a diameter of not more than 0.5 μ, and attain, or even xceed a length of 2 μ and a breath of 0.5 μ. They are capsulated. The icroorganism may be grown easily on all ordinary artificial media, not ly at the usual thermostat temperature (30-37°C) but also at room tempe-ture. The characteristics of the microorganism on the various culture edia are described. In artificial cultures it is non-motile, or only very ightly so and the germs lose their resistance to Gram's stain.

The author considers the bacterum to be a new species which he has lled, temporarily, *Bacterium pytymysi*.

Laboratory experiments on *P. savii*, *Mus sylvaticus*, *M. decumanus* id a small rabbit, have shown that the epizooty amongst field voles is ue to *Bact. pytymysi*, and that the virus is contagious for *P. savii* and also athogenic for other animals. The same bacterium was isolated from the ntestines of fleas taken from infected *Pytymys*. The contents of the intes-nes of three of these insects were inoculated into a healthy *Pytymys* hich died within 24 hours. Another apparently healthy *Pytymys* was laced in a glass jar with three living fleas ; the rodent died in 3 days. In oth cases the post-mortem examination showed the usual anatomical le-ons and a microscopical examination proved the presence of the bacterium the tissues of the various internal organs. These observations confirm ie surmise that infection of the epidemic in voles is carried by ectopa-sites such as fleas.

Whilst still having resort to poisons and other means of destruction, ie author proposes to let loose infected field voles in districts invaded by ese rodents where the epidemic has not yet appeared. He also proposes inoculate as many of these animals as possible with material from infected oles, and to distribute them among agriculturists in the various districts.

II. — In a third note (pp. 516-521) are described further experiments n the spreading of the epidemic among field voles. These experiments were arried out in the country in the grounds of the Agricultural School of Ce-gonola, and in a nursery of American vines in the district of " Pozzo delle apre ", near S. Severo. The results correspond entirely with those of the boratory experiments. Repeated inoculations of many voles with the irus of the epidemic were, therefore, made at the Laboratory of Agricul-ral Entomology of Rome, the Agricultural School of Cerignola and the ricultural Consortium of S. Severo. The animals thus infected were tributed amongst various infested districts. After some time the lents in the districts amongst which the infected voles had been distri-ed had either disappeared entirely or greatly diminushed in numbers r a very wide area. Any living voles caught and taken to the laboratory d within a short time and a post mortem examination showed the atomical changes and microbiological elements charactertistic of the ease. Cultures of the pathogenic microorganism showed the peculiar-s of *Bact. pytymysi* which have already been described.

Cultures of the bacterium isolated from the intestines of fleas from ected voles were again obtained. The fleas taken from *P. savii* seemed

to belong to the genera *Ceratophyllus* Curt., *Ctenopsylla* Kol. and *Hystrichopsylla* Fasch.

Besides the epidemic noted above been there have recently, in the Capitanata, other centres of mortality amongst field voles due to infection germs whose characteristics do not correspond entirely with those of the microorganism just described.

A number of dead *P. savii* which had been caught alive in different districts of the province of Foggia were examined at the Agricultural School of Cerignola. Some of these rodents showed anatomical and bacteriological characteristics absolutely identical with those of the animals from the "Contessa" district. On the other hand, some were distinguished by a tumour of the spleen which was much larger and less brown than in the case of the first voles. In this case a large number of thin, rod-like microorganisms were found in the internal organs instead of the short, thick bacteria found in the other.

In the tissues this microorganism is from 1 to 5 μ long and about 0.3 μ wide. It stains easily by the ordinary methods, but is less resistant to Gram's stain than the former bacterium. The cultures grow at room temperature, but better at ordinary thermostat temperature (30-37°). The morphology and measurements of the microorganism are similar to those shown in the tissues. There is no resistance to Gram's stain, and motility is fairly rapid. Its growth on various artificial culture media is described.

Pathogenically this bacterium is very active. When inoculated into *P. savii*, *M. sylvaticus* and *M. musculus*, it caused death very quickly, sometimes within 24 hours. In these cases the infection was always verified by microscopical examinations and by cultures. Sub-cutaneous inoculation caused infection on each occasion it was tried.

A microorganism which appeared to be identical with this second pathogenic bacterium of *P. savii* was isolated from a spontaneously infected *M. sylvaticus* from farms of Pavoncelli at Cerignola which had died at the Laboratory of the Agricultural School of Cerignola a few hours after its arrival there.

At the beginning of November, 1916, about 200 field voles were brought to the Laboratory of Agricultural Entomology of Rome. They had been caught at Torremaggiore, in a district where, for a long time, a mortality has been observed amongst these rodents. So far as was known no virus has ever been used against these animals in that neighbourhood. The animals began to die shortly after their arrival at the Laboratory, and, within two or three days, all were dead.

The post-mortem examination showed congestion of the internal organs, and a tumour of the spleen, more or less similar to that described above. The microscopical examination showed, in the affected tissues, a small bacterium morphologically identical with that of the second infection. Cultures of this microorganism differed from those of the bacterium previously specified. In the tissues it is found in the form of a Gram positive thin rod from 2 to 3 μ long and from 0.20 to 0.30 μ wide. Cultures on ordinary media usually develop slowly; the morphology and susceptibility

taining are similar to those in the tissues ; motility is not very rapid. The ehaviour of this bacterium in various culture media is described. It is athogenic for *P. savii* and *M. sylvaticus*.

Three species of pathogenic germs have, therefore, been found in field oles in the Capitanata. The author believes they have not been previous- described, and whilst still giving them in common the provisional name *Bact. pytymysi* he classifies them separately by the numbers I, II and II, according to the order in which they have been described. It is hoped ese three bacteria will prove very useful in controlling field voles.

97. — **The Musquash. (*Fiber zibethicus*), Injurious to Osiers in Bavaria and Bohemia.** — See No. 355 of this *Bulletin*.

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